# MEASURING CHILDREN'S PARTICIPATION FROM THE PERSPECTIVES OF PARENTS AND TEACHERS: RASCH ANALYSIS OF THE ACHIEVE ASSESSMENT

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# Abstract

Background - One of the most significant changes within healthcare practice and research is a shift from 'treating' disability at the level of body function to an ecological approach that addresses the children's involvement in everyday life, conceptualised as participation. Participation encompasses children's involvement across home, school and community settings. A complex interaction of personal characteristics, performance skills and environmental factors influence children's participation. Therefore, assessments that comprehensively and ecologically capture children's participation and contributory factors are important. Gathering information from parents and teachers may enhance the accuracy of information. Of the currently available assessments, few include multiple informants and provide an overarching portrait of the child's participation across all settings. The ACHIEVE Assessment is one that does and forms the focus of this work.

Methods - Services from across Scotland agreed to participate in the research by implementing the ACHIEVE Assessment and inviting parents to consent to use of their child's information. Rasch modelling was used to analyse the ACHIEVE Assessment. Parent and teacher questionnaires were also compared.

Results – The study includes a large clinical sample ranging in age from 4-17 years old, with an average age of 8 years. The results from the study demonstrate that the ACHIEVE Assessment provides unidimensional measurement of children's participation and contributory factors. The environment items measure a separate latent trait and are too easy for respondents to endorse.

Parent and teacher questionnaires fit on the same dimension. However, self-care and social skills items differ in function between respondents. In addition, there is a low correlation between parent and teacher questionnaires. Overall, items relating to children's participation in activities are easier than items about contributory factors. Process skills items are the hardest to endorse, despite the sample predominantly including children referred for reasons related to motor difficulties. Items about children's school activities are relatively harder than items about community activities. Finally, item function differs for children in the youngest age group.

Conclusion – Using Rasch analysis allowed exploration of the complexity of factors that interact to influence children's participation as captured by the ACHIEVE Assessment. The study demonstrates the measurement qualities of the participation items on the ACHIEVE Assessment, however the environment items require further development as a separate measure. The item hierarchy emphasises the importance of further investigating the association between children's process skills and their participation, in addition to research in the area of school participation. As there are only weak associations between parent and teacher reports, one is not substitutable for the other and multi-informant assessment will be an important strategy for gathering comprehensive information about children's participation.



Keywords – Participation; children; assessment; multi-informant report; Rasch analysis

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*Soli Dei Gloria.*

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# Chapter 1 – Introduction

## 1.1 Introduction

Every child has a right to participate in all aspects of life; including growing up with their families, taking part in community life and attending school (UNICEF 2013). Full engagement in life enhances children's health and wellbeing. Further, children's participation in all aspects of life is essential for creating vibrant and equitable societies (Council of Europe 2006, UNICEF 2013). However, various factors threaten the accomplishment of the realisation of children's rights to and opportunities for participation. The situation has improved significantly in recent decades (United Nations 2006). However, children with disabilities continue to face discrimination and barriers to their participation in everyday life (United Nations 2006).

Medical advancements mean that the number of children and young people with disabilities worldwide is increasing (UNICEF 2013). The increase in survival of children with disabilities and serious health needs also results in more comorbidity (Helders et al. 2003). Such comorbidities can cause complex impairments that have widespread impact on children's lives (Helders et al. 2003). There is consensus within research that, in comparison with their non-disabled peers, children with disabilities experience more restrictions in daily life (King et al. 2013b, Liberman et al. 2013, Peny-Dahlstrand et al. 2013). There is, therefore, a need to address such restrictions in order to enhance children's participation.

Paradigms of understanding and, consequently, responding to disability have undergone significant change in the past four decades (World Health Organization 2011, Read et al. 2012). As a result, current political and health literature reflects new approaches to conceptualising disability (Council of Europe 2006, BMA 2013, UNICEF 2013). Despite the historical use of hierarchical theories of development and medical models of disability, there has been debate surrounding the exclusive use of such approaches in recent years (Levac and Dematteo 2009). Recently, focus has turned to defining disability and development as resulting from complex interacting

subsystems incorporating children, their environment and the activities in which they engage (Levac and Dematteo 2009, Cameron 2014, Hunt 2014).

Children generally exert less influence on their daily habits and routines than adults do (Kielhofner 2007d). In addition, as children grow they continually learn new skills, their body functions develop and the influence that parents exercise over their life evolves (Darlington and Rodger 2006, Kielhofner 2007d). The combination of these changing factors means that children's daily lives differ from one child to another, between contexts and for individual children as they mature. The complexity of conceptualising disability is therefore further complicated within paediatric settings.

The move towards conceptualising disability and development as interactions between multiple factors is resulting in recognition that it is not sufficient to address only the physical effects of disability on a child's body. Instead, the priority is to address the impact that disability has on children's everyday lives (Read et al. 2012, Cameron 2014). Focus is therefore shifting towards enhancing children's health and well-being by addressing their participation, broadly defined as involvement in contextually relevant life situations (Kielhofner 2007a, World Health Organization 2008, UNICEF 2013). Recognition of the importance of participation is evident within multiple professional disciplines, including health, education and psychology (Adair et al. 2015).

Early identification and attempts to address the impact of disability on a child's life supports their participation (UNICEF 2013). In addition to addressing participation restrictions that individual children experience, it is therefore important to enhance research knowledge about children's participation more generally (Granlund 2013, Imms et al. 2016). Enhancing knowledge about participation involves identifying factors that support or restrict children in everyday life and disentangling the interaction between each (Granlund 2013, King 2013). Collecting such information requires assessments that comprehensively capture the richness of children's participation and contributory factors. This thesis attempts to address issues related to the assessment of children's participation.

## 1.2 Aims and Objectives

The purpose of this thesis is first to synthesise existing knowledge about children's participation through a literature review. Secondly, to contribute to attempts to better measure children's participation, the thesis includes consideration of issues relating to its assessment and a review of existing assessments. Finally, in order to contribute to conceptualisations and quality measurement of children's participation, the thesis presents findings from a research study to analyse an assessment of children's participation for completion by parents and teachers.

The aim of the research study is to answer the following questions:

- Is the ACHIEVE Assessment a quality, unidimensional measure of children's participation as demonstrated through Rasch modelling?
- How does the hierarchical structure of the ACHIEVE Assessment items contribute to understandings of children's participation?
- To what extent can information from parents and teachers be usefully combined or compared to further understandings of the complexity of children's participation?

The following chapter provides background to the thesis; the first section (1.3) begins with an overview of current disability prevalence. Section 1.4 provides a summary of the history and context surrounding models of disability. Focus then turns to addressing specific issues related to childhood disability, including priorities within childhood disability (section 1.5), consideration of developmental perspectives (section 1.6), the importance of family to paediatric work (section 1.7) and the importance of evidence-based practice (section 1.8). Section 1.9 identifies the rationale for the current study and section 1.11 includes literature approach that was followed. Section 1.10 describes the ACHIEVE Assessment and the researcher's context within the team associated with its development. Finally, section 1.12 provides the structure for the thesis.

The availability of sound data and subsequent analysis is essential to ensuring the visibility of children with disabilities within society (UNICEF 2013). There is, therefore, an expectation that governments collect quantifiable data about children with disabilities. However, multiple factors make the requirement for data a challenging prospect (UNICEF 2013). In particular, the ongoing changes in accepted disability definitions result in inconsistent use of measurement indicators. Reliable and accessible data about children with disabilities is therefore limited at both local and national levels (Read et al. 2012). Much of the available data is now out of date, limiting its relevance and current usefulness (Read et al. 2010).

In reality, statistics about disability are therefore likely speculative (UNICEF 2013). Current findings estimate that over one billion people worldwide have disabilities, of which between 110 and 190 million experience significant functional difficulties (UNICEF 2013). Sources also vary on prevalence of disability in children; research suggests that the number of children with disabilities is between 93 million and 150 million worldwide (UNICEF 2013). The Family Resources Survey identifies that approximately 7% of children in the United Kingdom have disabilities (Department for Work and Pensions 2015).

The lack of data creates challenges for identifying and measuring the impact of disability at societal levels (UNICEF 2013). However, there is evidence that children with disabilities face particular challenges. For example, there was a significant difference between educational attainment of children with and without special educational needs (SENs) in 2010/11 (Office for Disability Issues 2014). Further, there is a two-way link between poverty and disability; poverty is a contributory factor of disability and those who have disability are more likely to enter or remain in poverty (UNICEF 2013). According to the Office for Disability Issues (2014), 15% of families in the UK who have disabled children are living in low income and material deprivation, in comparison with 10% of families where no one is disabled. In part, this is due to the long-term impact of reduced opportunities for education and employment for those with disabilities (UNICEF 2013). In addition, meeting the needs of children with disabilities often results in increased expenses for families (UNICEF 2013).

Full realisation of children's rights requires improved knowledge and understanding of the barriers and challenges that those with disabilities encounter (UNICEF 2013). The prevalence of disability, even in developed countries, and the impact on children's daily lives is becoming apparent. However, part of the challenge in measuring the impact of disability is in confusion surrounding current conceptualisations (Read et al. 2012). Childhood further catalyses the complexity of conceptualising and responding to disability, as children's development shapes their ongoing daily function (Berk 2013). The following sections explore current understandings of children's disability and development.

## 1.4 Models of Disability

Historically, there was a tendency to focus on disability as the defining feature in a person's life (Hunt 2014). Society viewed people with disabilities as being passive and requiring help, a perception that led to the creation of professions purposed with serving this population, the 'helping professions' (Finkelstein 2014). Finkelstein explains that the thought process was "disabled people cannot do things…and therefore we intervene to help", central to which is the notion that disabled people possess the 'problems'" (2014 p. 6). Impairment and disability therefore had negative connotations that led to the assumption that those affected had a reduced quality of life (Officer and Groce 2009). As such, others often perceived those with disabilities as being unfortunate (Hunt 2014).

The medical model of disability further infers a causal link between impairment and disability; measuring a person's health and well-being based on the presence of impairment or reduced physical function (Officer and Groce 2009). Such perceptions continue to influence areas of healthcare, for example in the existence of health indicators that attempt to quantify health based on illness or impairment (Mont 2007). Such calculations suggest that a life lived with impairment is of lesser quality than a life lived without, regardless of the extent of an individual's engagement in society (Mont 2007). However, equating impairment with reduced quality of life does not reflect the experience of many people with disabilities (Connors and Stalker 2007, Cameron 2014).

Individuals or groups of people with disabilities sharing their experiences and voicing their concerns have fuelled changes in disability conceptualisation (World Health Organization 2011, Hunt 2014). In the 1970s, disability activists took steps to reconstruct conceptualisations in the context of their experiences (Cameron 2014). They took steps to sever the causal link between impairment and disability, instead asserting that disability results from societal attitudes and barriers (Cameron 2014). The resulting social model of disability began to win favour over traditional medicalised perceptions.

The so-called 'social model of disability' has had significant influences in disability policy and research (Read et al. 2012). One such example is the influence that the social model had on the UN Convention on the Rights of Persons with Disabilities, which includes emphasis on the right for all children to enjoy full human rights and freedoms (United Nations 2006, Read et al. 2012). The new understandings of disability brought by the social model are an important development that triggered a global drive for political and social change (Colver 2009, Cameron 2014). However, scholars caution that a social model cannot capture the full complexity of childhood disablement as something that extends beyond structural and material barriers (Egilson 2014).

Contention surrounding the issue of defining disability as a construct therefore remains and discussion is ongoing (Read et al. 2012). Adoption of the social model of disability drew attention to disabling aspects of society, including physical and social barriers, that individuals may face (Cameron 2014). Within original formations of the social model of disability, any focus on impairment was heavily criticised (Cameron 2014). However, Morris (1991 cited in Cameron 2014 p. 13) highlighted that although "environmental barriers and social attitudes are a crucial part of our experience of disability – and do indeed disable us – to suggest that this is all there is to deny the personal experience of physical and intellectual restrictions…". By conceptualising the body as separate to self, the social model of disability therefore mirrors aspects of the medical model (Cameron 2014).

The stipulation by those with disabilities that impairment is relevant to their lives and affects their interaction with the world has been instrumental in adopting a

broader, interactive understanding of disability (Colver 2009). Early advocates of the social model of disability argue that it was never the intention to abandon the medical model nor that the social model become the sole means for framing disability (Oliver 2013). Recent work has therefore taken steps to highlight that disability is a product of "the complex interaction between individual characteristics, including impairment and chronic illness, and the social and cultural context (Read et al. 2012 p. 224). An interactional perspective of disability is positive because it supports recognition of the full range of potential experiences of people with disabilities (Colver 2009). The following section overviews current priorities within childhood disability in particular.

## 1.5 Moving Forward: Paediatric Disability Priorities

Work in children's healthcare practice and research is increasingly influenced by recognition that children are not "passive objects owned by their parents but rather [are] social actors in their own rights, contributing in various ways to their families and their communities" (Colver 2009 p. 657). Therefore, rather than view childhood as simply a transitional phase to adulthood, it is to be valued and receive special attention (Colver 2009). As with adults, however, children with disabilities should have enjoyment of human rights and full participation on an equal basis with others (United Nations 2006).

Over the past decade there has been growing recognition of the potential for children with disabilities to enjoy lives that are as full as those without disabilities, no longer focusing primarily on what they lack (Read et al. 2012, UNICEF 2013). There is particular recognition that "given opportunities to flourish as others might, children with disabilities have the potential to lead fulfilling lives and to contribute to the social, cultural and economic vitality of their communities" (UNICEF 2013 p. 1). Therefore, there is a global push to prioritise the inclusion and participation of children with disabilities in all aspects of life (UNICEF 2013).

According to UNICEF (2013), vibrant and equitable societies require the inclusion of children in every aspect of life. The Convention on the Rights of Persons with Disabilities (CRPD) was instrumental in taking steps to promote the dignity, worth

and equal rights of all persons with disabilities (United Nations 2006). The CRPD includes a selection of articles that seek to address barriers and realise the full participation of all people (United Nations 2006). Following the CRPD, the Council of Europe provided an action plan for promotion of the rights and full participation of people with disabilities (Council of Europe 2006). The CRPD, Council for Europe Action Plan and similar initiatives take steps to promote the importance of upholding the rights of all children to participate in all aspects of life (Council of Europe 2006).

Although children with disabilities may require additional support, their needs and aspirations are not unlike children without disabilities (McConachie et al. 2006, Bekken 2014). Supporting the participation of individual children with disabilities can enhance society as a whole, thus the impact extends across multiple levels (UNICEF 2013). Participation is therefore a major focus of healthcare research and a primary outcome for services working with children (Parkes et al. 2010, Adair et al. 2015). One of the particular challenges to enhancing children's participation is the variety of influences on children's lives, including their own development. The following section overviews understandings of child development.

## 1.6 Disability and Children: Developmental Perspectives

In addition to disability models, theories of development are an important foundational aspect of research and practice with children. Development is a remarkable process in which "a child develops as he or she struggles with, and conquers, the world outside" (Jennings 1999 p. 14) that researchers have long undertaken to explain. Developmental theories exist to explain and describe the process of change as children mature towards adulthood (Case-Smith et al. 2010).

There are many available theories of child development, yet each seems to hold little compatibility with the other (Lewis 2000). Central to theoretical underpinnings of children's development are discussions of whether intrinsic (personal) or extrinsic (environmental) factors have the greater influence (Berk 2013). In this sense, there are similarities between discussions surrounding theories of child development and models of disability. Although theorists typically recognise intrinsic and extrinsic influences, there is different weighting given to each (Berk 2013). However,

contemporary theorists are less likely to ascribe wholly to a single perspective in relation to the key issues of child development (Case-Smith et al. 2010).

Literature instead points to the variability between children's developmental trajectories (Fagard and Lockman 2005, Berk 2013). Children from apparently similar backgrounds and contexts can display contrasting development outcomes (Case-Smith et al. 2010). As such, there is growing consensus to move away from traditionally deterministic theories towards a more flexible approach to understanding development. Smith and Thelen (2003 p. 343) argue that development is best understood as "the emergent product of many decentralised and local interactions that occur in real time". Approaches such as Vygotsky's sociocultural theory, ecological systems theory and dynamic systems theory view development as a process that can follow many possible trajectories (Berk 2013).

Theories that explain development as emerging from an interaction of factors therefore reflect the richness and complexity of children's lives (Bekken 2014). In this sense, such developmental theories link closely with current definitions of disability. Children with disabilities relate their experiences of daily life to both impairment and their environment (Connors and Stalker 2007). Therefore, focusing exclusively on impairment means little for children as such a perspective does not link with their experiences of disability (Bekken 2014). Echoing changes in disability and development conceptualisations, there have been changes in the relationship between healthcare professionals and families of children with disabilities. The following section overviews such changes in the perception of families within healthcare.

## 1.7 Children and their Families

Paediatric work extends beyond working with children to include significant members of their social environment, particularly their family (Porter and McKenzie 2000). In parallel with other healthcare developments, the influence that parents have on children's lives has evolved over the years (Porter and McKenzie 2000, Franck and Callery 2004, Law et al. 2005). Parents previously had little input in the lives of children with disabilities, healthcare professionals often assuming dominance

based on expertise (Law et al. 2005). In earlier models of working, medical professionals therefore had a significant influence on the care of children with disabilities. In an either-or dynamic, professionals did not view parents as having valuable contributions to children's care. Over time, professionals changed the way they work with families, first communicating, cooperating and then coordinating children's care with their parents (Porter and McKenzie 2000, Franck and Callery 2004).

The result is that the degree of control and influence that parents have over the lives of children with disabilities has increased and professionals now seek to work in partnership with families (Crais et al. 2006, Pickering and Busse 2010). In addition, where professionals were previously the primary source of expertise on children's disabilities, family-centred practice now sees parents as being experts in the lives of their own children and thus key sources of information (Crais et al. 2006). Recognition of the value of parental perspectives and involvement in their children's lives is therefore shaping current healthcare research and practice today; with a move towards utilising parent information about children's participation (Rosenberg et al. 2013b, Mei et al. 2015, Lyons et al. 2016).

## 1.8 Evidence-Based Practice

The increasing complexity of healthcare service provision has fuelled emphasis on evidence-based practice (White 2012). Originally developed on the premises of evidence-based medicine, definitions of evidence-based practice typically describe, "the conscientious, explicit and judicious use of current best evidence in making decisions about the care of individual patients" (Sudsawad 2006 p. 656). One of the key principles of evidence-based practice is for clinicians to have access to the right answers at the right time for the questions that arise in practice (Hack and Gwyer 2013). Evidence-based practice involves conscientious gathering and judicious use of evidence from a variety of sources, including research studies and clients' own perspectives (Taylor 2007). There is, therefore, a need for clinicians to use evidence-based practice to be able to demonstrate the clinical effectiveness, cost effectiveness and, thus, justification of the interventions or assessments that they use (Taylor

2007). As far as possible, clinicians should select practice tools and approaches that research demonstrates to be effective (Kielhofner 2006a).

Integrating research evidence into practice ensures that clinicians do not solely base their decisions on opinion (Sudsawad 2006). Clinicians instead use their clinical skills and experience to combine knowledge of their client with available research evidence to guide their decisions and intervention process (Hack and Gwyer 2013). Central to this process of evidence-based practice is the availability of good quality information (Taylor 2007). Carrying out research within priority areas is crucial to supporting evidence-based practice (Kielhofner 2006a). Research studies can provide evidence for the quality of assessments, which in turn ensures the quality of information that therapists or researchers are able to gather about individuals or populations of interest.

## 1.9 Rationale for Current Study

It is no longer sufficient to address only children's impairments, rather addressing the impact of disability on children's lives. Participation relates to children's involvement in all of life, including family life, civic engagement and education (UNICEF 2013). However, there are discrepancies between the participation of children with and without disabilities (Coster et al. 2013a, Law et al. 2013, Michelsen et al. 2014). Therefore, participation is a global priority for those responsible for influencing and delivering the care and support of children with disabilities, whether at individual or population levels. Given the specificity of childhood as distinct from adulthood, it is not appropriate to directly translate information about adults with disabilities to childhood (Colver 2009).

Research in the area of children's participation is therefore increasing, including large-scale empirical studies investigating factors that influence children's participation (Imms et al. 2016). However, one of the key challenges for participation research is the quality of assessments used for measurement (Phillips et al. 2013, Rainey et al. 2014). A limitation of existing participation research is the exclusive use of parent-report information. Although there is a move towards also including child-report information, few studies incorporate information from teachers. Teachers may

not have the same intimate perspective as parents; however, their knowledge of children in the education context means that theirs is a useful insight for understanding participation at school (Jacobs 2012). In addition, it is essential that assessments that researchers use for studies investigating children's participation are conceptually relevant and exhibit strong measurement qualities.

In order to address this gap within research investigating children's participation, this thesis overviews work undertaken to analyse an assessment for children's parents and teachers. To provide context for the work, the thesis begins with chapters exploring factors affecting children's participation and important aspects of assessment, different approaches and the necessity of parent and teacher perspectives.

## 1.10 The ACHIEVE Assessment

The ACHIEVE Assessment is designed to gather information about children's participation using parent and teacher questionnaires. The questionnaires, designed for use with children aged 3-18, support identification of children's strengths and limitations across home, school and community settings. In addition to the "What?" section which measures the frequency of children's participation in these settings, the ACHIEVE Assessment includes a "Why?" section incorporating items designed to identify contributory factors of children's participation.

Contributory factors captured by the ACHIEVE Assessment include habituation, volition, motor skills, social interaction skills and process skills. However, to make the assessment accessible to parents and teachers, the terminology in the assessment was changed (see Table 1-1). Gathering such information from parents and teachers ensures contextual assessment of children's performance skills. The information therefore better reflects children's performance skills as relevant to everyday participation as is possible in standardised assessments. The ACHIEVE Assessment therefore provides therapists and researchers with a comprehensive overview of children's participation and potential supportive or restrictive factors.

Pentland et al. (2016) undertook a study to evaluate and develop the delivery of occupational therapy services for children with DCD. Drawing on information from

an extensive systematic review of existing evidence (Forsyth et al. 2008) and using information about current practice as reported by parents, teachers and therapists, the team developed a pathway for children's service delivery. The ACHIEVE Assessment was a key output of this study, using MOHO (Kielhofner 2007a) as a conceptual basis and with input from international collaborators. Although initially designed with these populations in mind, the ACHIEVE manual highlights the applicability of the assessment with a wider group of children.

Following initial development of the ACHIEVE Assessment; a pilot site was identified for early implementation. The ACHIEVE team identified a need for an extensive and formal study to analyse the assessment's measurement qualities to support wider distribution and evidence-based practice. The researcher took up a PhD opportunity within Queen Margaret University, created with the intention of carrying out the work. The researcher is a trained occupational therapist with a particular interest in children's participation, who had not previously been involved in the development of the ACHIEVE Assessment or the earlier research studies. However, the researcher contributed to the development of a publication output associated with the work of the ACHIEVE team (Pentland et al. 2016).

**Table 1-1 - Alternative terminology used within the ACHIEVE Assessment**

| MOHO Concept | ACHIEVE Assessment sub-sections |
|---|---|
| Habituation | Routine & Role |
| Volition | Confidence |
| Communication and Interaction Skills | Social Skills |
| Process Skills | Organisational Skills |
| Motor Skills | Physical Skills |

Three initial versions of the ACHIEVE Assessment are available: standard, ADHD and DCD. Each version has the same core set of questions (49 items total), with the DCD version including a copy of a DCD screening questionnaire and the ADHD version including an additional subsection (five items) relating to emotions and sensations. Each item on the ACHIEVE Assessment is rated on the same 4-point Likert scale, indicating how often the statement is true of the child or the environment. The parent and teacher questionnaires follow an equivalent structure and item content. Appendices 14 and 15 include parent and teacher copies of the ACHIEVE Assessment

questionnaires. In addition, appendix 16 includes the coding and abbreviated content used to describe items in the current study.

## 1.11 Literature Strategy

Participation is a continually developing area of interest, thus a broad approach to searching for literature for the background chapters was appropriate. One of the challenges in identifying relevant literature was separating that which relates to children participating in research, rather than participation in daily life. Further, although participation is a concept relevant to childhood and adulthood, the contextual differences between these life stages means that participation is likely to manifest differently in each. Therefore, the background chapters primarily draw on literature from paediatric disciplines, with some reference to adult literature. The search strategy used for the review of existing assessments (chapter 4) is included within that chapter.

## 1.12 Thesis Outline

The following provides an outline of the thesis structure:

**Chapter 2 - Participation**

The chapter begins with an exploration of children's participation; first considering current conceptualisations of the construct and identifying key contexts for children. Much of the discussion surrounding children's participation reflects current understandings of disability and child development regarding the interaction of contributory factors. The chapter continues with a review of available research literature investigating the associations between child characteristics, various aspects of child function or performance skills and their participation outcomes. Due to the complex interaction of factors, each characteristic can affect individual children differently and variably. The following section then explores the research available about the particular influence of the environment on children's participation. Finally, the chapter summary discusses the complexity of the interacting factors and the need for further work in the area of childhood participation research.

**Chapter 3 - Assessment**

Having explored conceptualisations of participation, the next chapter in the thesis focuses on assessment. Assessment practice within healthcare has seen ongoing developments in recent years, including changes in understandings of who is better to give accurate and comprehensive information about children's behaviour. In line with moves away from medical models of disability wherein professionals were considered the experts, there is now recognition that clients themselves have an important insight into the impact of disability on their daily lives. This is particularly true within the area of child participation, where involvement in life situations is the focus.

Assessments carried out in standardised environments are unlikely to provide a true reflection of children's day-to-day participation and thus alternative strategies are important. Ecological assessment approaches, whereby attempts focus on capturing a comprehensive profile of a child's life, are increasing in favour. However, much of the focus to date has been on using either parent or child report. Although both perspectives are valuable and important, they do not offer a complete picture, particularly of school aged children. School is a central feature of children's lives and teachers have a special insight into their school participation. Therefore, gaining teachers' perspectives may enhance understanding of children's participation across settings.

**Chapter 4 – Assessment Review**

The fourth chapter includes a critical review of currently available assessments of children's participation, including consideration of their conceptual relevance and measurement qualities in the context of the previous chapters. Several assessments exist for measuring children's participation, reflective of the recent interest in the construct. This chapter identifies a selection of such assessments and considers the extent to which they comprehensively capture children's participation. In particular, the chapter includes evaluation of the assessments according to which settings of children's participation they capture and from which perspectives they gather information. Finally, in recognition of the importance of high quality measurement,

the chapter includes consideration of published evaluations of the available assessments' measurement qualities.

The second half of the thesis focuses on the original work completed, as follows:

**Chapter 5 - Methods**

This chapter details the rationale for the study, the methods and approaches followed. The chapter begins with an exploration of background issues relating to the analysis of assessments, including research paradigms and measurement theory. The ACHIEVE Assessment was developed following extensive research with service providers and users, in addition to input from international collaborators. Therefore, the focus for this study was primarily on the quantitative analysis of the ACHIEVE Assessment's measurement qualities. Rasch analysis was the approach adopted to evaluate the measurement qualities of the ACHIEVE Assessment. Rasch analysis allows determination of whether an assessment captures a single construct and does so in a way reflective of true measurement. The chapter includes details of the processes followed and the criteria used within analysis.

**Chapter 6 - Results**

This chapter details the results from the study, including analysis of the ACHIEVE Assessment and comparison between parent and teacher reports of children's participation. The chapter is structured to first present the results from the analysis of the ACHIEVE Assessment measurement qualities then detailing findings from comparison of parent and teacher report. Interpretation of the results and decisions regarding next steps were made in line with knowledge about the underpinning theories of participation and current guidelines within Rasch analysis literature.

**Chapter 7 - Discussion**

This chapter includes the thesis discussion, bringing together findings from the current study with existing research. As with the results chapter, the discussion chapter begins by addressing issues relating to the evaluation of the ACHIEVE Assessment. The chapter then proceeds by discussing the findings within the context of current conceptualisations of participation and multi-informant report. The findings highlight the complexity of children's participation, the importance of

capturing all contributory factors including each performance skills set and the value of doing so from multiple perspectives.

**Chapter 8 - Conclusion**

Finally, chapter 8 briefly concludes the thesis with an overview of all topics discussed, a summary of the findings of the work and a consideration of strengths and limitations. The chapter also includes suggestions of directions for future work.

# Chapter 2 - Participation

## 2.1 Introduction

Participation is a right for all children, regardless of disability or social context (United Nations 2006). Recognition of the value of participation has led to it becoming a global priority for healthcare research and practice (Soref et al. 2012, Granlund 2013, Imms et al. 2016). The prioritisation of participation has arisen from changes in understanding and responding to disability. In particular, there is a move to conceptualise disability as resulting from an interaction between the person and their environment, rather than as a direct consequence of either impairment or environmental restrictions (United Nations 2006, Levac and Dematteo 2009). Addressing children's participation provides a means of addressing the impact of disability on their lives.

Participation is most broadly defined as an individual's involvement in everyday life (Kielhofner 2007b, Imms et al. 2016). However, the contextual nature of the construct and interaction of contributory factors make conceptualisation of participation complex (Raghavendra 2013). Therefore, attempts to increase knowledge about children's participation face significant challenges, which reflects in the current literature.

Literature describing conceptualisation of participation often refers to the complex nature of the construct and the surrounding debates (Hoogsteen and Woodgate 2010, Granlund 2013, Raghavendra 2013). Key debates surrounding conceptualisation of participation include its distinction from activity performance, in addition to the relevance of subjective or objective aspects (Colver 2009, Parkes et al. 2010, Maxwell et al. 2012). However, rather than be a reason to disregard participation as too complex to address, the ongoing discussion and lack of consensus highlight the value of further considering the construct in-depth (Granlund 2013). In addition, participation contributes to children's health and development. Therefore, there is value in increasing understanding in this area and ultimately enhancing outcomes for children (Colver 2009, Imms et al. 2016).

Research indicates that a complex interaction of personal and environmental characteristics contributes to children's participation and barriers are prevalent (Coster et al. 2013a, King 2013, Adair et al. 2015). Notably, how a certain personal characteristic affects a child's participation depends largely on the interaction with environmental features and vice versa, thus the impact is rarely the same for all children (Fauconnier et al. 2009, Adolfsson et al. 2011). Participation is therefore specific to individual children (Soref et al. 2012, Egilson 2014). In addition, although participation applies in principle to people of all ages, the way in which it manifests may differ between adults and children (Adair et al. 2015). Therefore, it is problematic to generalise findings about adults' participation to children (Adair et al. 2015) and this chapter thus primarily draws on paediatric literature.

The primary aim of this chapter is to review current understandings of participation. The first section (2.2) explores current conceptualisations of participation, section 2.3 overviews key settings for children's participation and the final section (2.4) summarises currently available research investigating factors that influence children's participation.

## 2.2 Conceptualising Participation

At the most basic level, participation means, "to be involved" or "take part" (Stevenson and Waite 2011). However, participation is a concept familiar to a variety of sectors and interpretation of the basic dictionary definition changes across each (Law et al. 2006, Hoogsteen and Woodgate 2010). The governmental paper on the Convention for Rights of Persons with Disabilities (CRPD) refers to participation in a general manner that relates to "having the right, the means, the spaces and the opportunities and where necessary the support to participate in and influence decisions and engage in actions and activities so as to contribute to building a better society" (United Nations 2006 p. 5). In this sense, participation is something that serves a purpose, manifests as involvement in society and has both individual and societal impacts.

More specifically, and particularly within the context of healthcare practice and research, participation relates to an individual's involvement in life situations

(McConachie et al. 2006, World Health Organization 2008, Hoogsteen and Woodgate 2010). Literature defining participation as involvement in life situations most typically refers to the ICF definition (Coster 2008, World Health Organization 2008, Adair et al. 2015). However, a wealth of literature advocates a more complex understanding of participation than the ICF definition suggests (Hemmingsson et al. 2009, Hoogsteen and Woodgate 2010, Adolfsson et al. 2011, Adair et al. 2015). Although there is widespread acceptance of participation as a priority within health and social care, confusion therefore surrounds its conceptualisation (Imms et al. 2016).

Discussion highlights confusion in distinguishing between the terms 'activity' and 'participation'. The confusion in part stems from the grouping of both concepts within one domain in the ICF. Parkes et al. (2010 p. 305) suggest, "activity reflects the ability to execute a task or series of physical tasks, whereas participation is a more complex set of life behaviours that can be achieved using a dynamic variety of tasks". Although one does not directly translate to the other, there is a sense in which activity performance is necessary for successful participation (Maxwell et al. 2012).

Confusion therefore arises when activity performance in standardised environments (i.e. 'capacity') is treated as equivalent to engaging with activities in real-life contexts ('participation') (Maxwell et al. 2012). The primary distinction between capacity to perform an activity and real-world participation is that the latter is contextualised (Maxwell et al. 2012). Research focusing exclusively on children's ability to perform certain activities without consideration of the environmental context is therefore problematic (Law et al. 2006, Fauconnier et al. 2009). There is a need to develop and support research that comprehensively investigates children's participation as full engagement in everyday life.

Further discussions relate to whether the focus of participation conceptualisation ought to be subjective experience or observable performance (Hemmingsson et al. 2009, Pereira et al. 2010). Cole (2010) suggests that including consideration of both subjective experience and objective, observable performance is important when conceptualising participation. However, the subjective experience relates more closely with quality of life than being an indicator of participation in itself (Colver

2009). Although information about a child's subjective experience is beneficial, the objective aspects of involvement and attendance are more relevant to measuring participation (Imms et al. 2016). Participation as involvement in life situations is the primary focus of this thesis, reflecting the conceptual distinction between participation and quality of life, in addition to current definitions of the concept. However, as children's preferences and enjoyment influence their participation, the review also includes reference to subjective experience.

## 2.3 Settings of Children's Participation

Participation in all aspects of life during childhood is crucial for successful transition to adulthood (Parkes et al. 2010). Law (2002) suggests that optimum participation requires involvement across a variety of environments, a view that reflects recommendations within the CRPD and World Health Organization world report (United Nations 2006, World Health Organization 2011). Children move between a variety of settings that shape the types of activities available to them (King 2013, Law et al. 2013, Shikako-Thomas and Law 2015). Although it is possible to measure children's activity capacity outside of their normal environment, measurement or identification of participation therefore requires understanding their context (Fauconnier et al. 2009, Maxwell et al. 2012). Thus, it is not appropriate to consider children's participation apart from the settings in which it occurs (Parkes et al. 2010).

The three main settings for children's participation are home, school and the community (Parkes et al. 2010). The roles expected of children within specific settings somewhat shape their participation, for example student at school, family member at home, or dancer in the community. Each role requires a particular set of activities that allow a child to fulfil that role. The following sections overview the three key settings of children's participation including home, school and community.

### 2.3.1 Home

Research indicates that 99.1% of children with disabilities in the United Kingdom now live at home where their families provide support (Contact a Family 2016). The home and family context is therefore a key setting throughout all of childhood, and as

such is becoming a priority focus within participation research. The family environment influences children's roles and thus wider participation (Darlington and Rodger 2006). Time spent at home with their families provides children with opportunities to participate in a variety of activities including play (McConachie et al. 2006, Law et al. 2013). Within the home environment children also engage with self-care, establish relationships and develop a sense of self.

Children's participation is closely associated with that of their family (Liberman et al. 2013). Therefore, there is a predictive association between family participation and children's own participation in leisure activities (Bult et al. 2013). Feeling restricted as a family due to one person having disabilities, limited finances or available community resources can have a negative influence on children's participation (Bult et al. 2011, Liberman et al. 2013). Further, having a child with a disability is associated with increased rates of poverty, reduced rates of maternal employment and increased costs of upbringing (Papworth Trust 2016).

### 2.3.2 School

School is another major feature of children's lives and thus is an area in which it is important to understand their participation (Egilson 2014). Current education and government policy emphasises the importance of including children with disabilities in all aspects of school life (Coster et al. 2013a, UNICEF 2013). The priority now is that all children, including those with disabilities, have equal opportunities to access education, as a fundamental right (UNICEF 2013).

In 2015, 22.5% of all school pupils in Scotland had additional support needs, of which over 10% were assessed or declared disabled (Scottish Government 2015). Of those children with additional support needs attending mainstream school, 92% spend all of their time in mainstream classes, reflecting current inclusive education practices (National Statistics 2016). However, the interpretation of 'additional support needs' differs from that of disability and thus the extent to which these statistics represent all children with disabilities may be limited.

Although the initial focus may be on academic learning, participation at school is also valuable for enhancing children's social interactions and can contribute to overall quality of life (Peny-Dahlstrand et al. 2013). In addition to the immediate value, educational participation has long-term benefits including employment, social security and preparation for participation in all of life (UNICEF 2013). Thus, school participation has important consequences for childhood and adulthood.

School participation is consistently lower for children with disabilities than those without, the most significant difference being in the extent of their involvement (Coster et al. 2013a). Depending on the school and the child, there may be activities that schools do not make available for children with disabilities, thus reducing their participation when compared with children without disabilities (Peny-Dahlstrand et al. 2013). Children with disabilities tend to participate less in activities that involve spending time with peers outside of class or taking part in school teams, clubs and organisations (Coster et al. 2013a). The physical environment and individual teaching styles also influence the expectations for children's school participation (Peny-Dahlstrand et al. 2013).

### 2.3.3 Community

The third setting for children's participation is the community. Community and leisure participation are particularly important for children with disabilities (Bult et al. 2011). Community participation includes formal activities such as structured, organised groups or courses and informal activities including spontaneous play or time with friends (Shikako-Thomas et al. 2013). Participation in leisure activities outside of the home is beneficial for children's skill-development, self-enrichment and developing social relationships (Bult et al. 2011, Peny-Dahlstrand et al. 2013). In addition to supporting children's skill acquisition, participation in leisure and recreation activities therefore supports children's identity development (Anaby et al. 2014).

Participation in physical leisure activities can support health in childhood, which has positive consequences throughout the rest of life (Lauruschkus et al. 2015). The community often provides opportunities for participation in leisure activities,

including organised sports clubs and outdoor physical play with peers (Lauruschkus et al. 2015). Prevention of health conditions associated with disability is an important issue for development and includes recognising barriers within children's environments that prevent them from participation in physical activities (World Health Organization 2011). Reducing the risk of concurrent health conditions such as obesity through engagement in physical activities is therefore important for all children, including those with disabilities (Lauruschkus et al. 2015). Leisure activities outside of school and, where available, outside of the home, are therefore key for children's development, health and well-being (Shikako-Thomas et al. 2013).

### 2.3.4 Settings Summary

Home, school and community settings are the three key contexts for children's participation. Participation in each setting has particular immediate and longer-term benefits. Existing research includes investigation of children's participation in each of the three settings. However, in comparison with the community setting, school and home participation have received relatively less attention. Existing literature indicates that children's participation is contextual, influenced by which setting they are in at a given time. However, the variety within and between each of these settings means that the impact of either on a child's participation is unlikely to be consistent across all children. Therefore, a complex interaction of factors can contribute to children's participation and there is a need to address them across all settings. The following sections overview some particular factors that research identifies as important, framed according to the Model of Human Occupation (MOHO).

## 2.4 Contributory Factors of Children's Participation

Children's participation is dependent on an interaction between children, the environment and the activities that they engage with in their own contexts (Fauconnier et al. 2009). Conceptualising participation as an interaction reflects the departure from exclusively defining disability according to the social or medical model (Colver 2009, World Health Organization 2011, Swain 2014). Such conceptualisation supports a comprehensive and relevant understanding of the

impact of disability on children's lives (World Health Organization 2011). Similarly, these conceptualisations of disability and participation align well with developmental theories that emphasise the contribution of extrinsic and intrinsic factors (Smith and Thelen 2003, Levac and Dematteo 2009).

Childhood disablement is now understood to be more complex than previously conceptualised and beyond reduction to an analysis of extrinsic barriers (Egilson 2014). Were it possible to remove all extrinsic environmental barriers, individuals would still experience participation restrictions due to underlying impairment or other personal factors (Connors and Stalker 2007, Swain 2014). Children themselves report the effect that impairment has on their daily experience of disability (Connors and Stalker 2007). Therefore, although there is, rightly, much focus on the influence of the environment on children's participation; it is also important to note the contribution of factors intrinsic to each child (Egilson 2014).

The variety of measurement strategies that researchers use creates challenges surrounding investigating factors that cause children's participation to manifest differently (Kanagasabai et al. 2014, Schreuer et al. 2014). Current studies investigating children's participation include use of the PEM-CY, LIFE-H and CAPE-PAC assessments, among others (Noreau et al. 2007, Fauconnier et al. 2009, Brown et al. 2011, Law et al. 2013, Anaby et al. 2014). The assessments differ slightly in their purpose and content, affecting the comparability of findings. In addition, studies focus on particular aspects of children's participation; for example home-based activities (Law et al. 2013), leisure activities (Goltz and Brown 2014, Kanagasabai et al. 2014, Schreuer et al. 2014) or school activities (Coster et al. 2013b, Peny-Dahlstrand et al. 2013). Although each activity type has value, they are different in their context, which can in turn affect the data they produce and thus are not readily comparable between research studies.

In addition, many of the research studies currently available predominantly use parent-report assessments to gather data (Mâsse et al. 2013). Such assessments are valid and reliable. However, the extent to which parents are aware of their child's participation outside of the home may be limited, thus reducing the comprehensiveness of these studies (Mâsse et al. 2013). There is therefore a need for

careful interpretation of findings and for caution in inferring absolute conclusions. The following section includes discussion of current studies that report investigations of factors influencing children's participation.

### 2.4.1 Personal Characteristics

The following sections summarise findings about the association between children's participation and their age (2.4.1.1), gender (2.4.1.2) and impairment (2.4.1.3).

#### 2.4.1.1 Age

Childhood covers a wide age range, within which there is a great deal of variability due to child development and contextual expectations of children at certain ages (Bult et al. 2011). The nature of child development and life experience suggests that participation will manifest differently as children mature (McConachie et al. 2006). Further, age-related institutional or cultural expectations mean that everyday life situations for young children differ from those of older children and adolescents (Adolfsson et al. 2011). However, in the past there has been relatively little research investigating participation across the full span of childhood (Adolfsson et al. 2011). The research investigating the association between age and children's participation is therefore inconsistent (King et al. 2013b).

A large study with children aged 5-17 years with and without disabilities reports only a negligible association between age and children's participation across home, school and community settings (Anaby et al. 2014). Similarly, Little et al. (2014) found minimal differences between older and younger age groups of children with autism spectrum disorder (ASD) when investigating their participation in neighbourhood-social activities. A further, relatively small study with typically developing children found no statistically significant association between age and leisure participation (Goltz and Brown 2014). This study had a much narrower age-range (10-14) which may influence the findings regarding age effect.

Shikako-Thomas et al. (2013) similarly report findings from their study using the Children's Assessment of Participation and Enjoyment (CAPE) with adolescents showing significant age effect only in their diversity of recreational activities.

However, the authors compare their study with one using the CAPE with younger children and report consistently lower mean scores in each domain for the adolescents (Shikako-Thomas et al. 2013). Similarly, Law et al. (2006) report findings from research with children with complex disabilities that suggest older children had overall lower participation than those in younger groups.

Within research that identifies an association between participation and age, there is a trend of younger children participating in a greater diversity of activities and more intensely in physical activities. Conversely, adolescents participate with higher intensity and frequency in more complex or socially based activities (Klaas et al. 2010, King et al. 2013b, Ullenhag et al. 2014). The different age groups of children in studies, for example 6-14 years in Law et al. (2006), 5-12 years in Little et al. (2014) and 10-14 years in Goltz and Brown (2014), likely influence the extent or type of difference that they report. Although studies vary, there is an indication that age is associated with children's participation, a finding mirrored in Bult et al.'s systematic review of leisure participation for children with physical disabilities (2011). However, variability is most evident when examining types of activities, rather than participation as a composite score.

Age effects are also evident in a study that indicates that although all children with disabilities participate less at school in comparison with their peers without disabilities, the most significant differences occur when comparing older and younger students (Coster et al. 2013a). Concurrently, findings from a study examining participation in children with spinal cord injury indicate differences between children aged 6-12 years and those aged 13-18 years (Klaas et al. 2010). Similar findings, reporting significant differences between the participation of older and younger children in certain types of leisure activities are evident elsewhere (Ullenhag et al. 2014).

Research highlighting age-related differences in children's participation aligns with theory about activity demands as experienced by older and younger children (Adolfsson et al. 2011). For example walking up and down steps places a greater demand on younger children than older children for whom it is already an established skill (Adolfsson et al. 2011). Participation differences between older and

younger children therefore reflect general development trajectories (Coster et al. 2013a). However, other potential interacting factors include changes to the environments in which children participate; for example, the transition from one school to another as children age results in a change of physical and social environments that creates new demands (Coster et al. 2013a). Children's own perceptions of social or physical barriers within the environment may also change as they enter adolescence (Lauruschkus et al. 2015).

Barriers to participation, as reported by parents, increase as children age, which may reflect greater expectations for children to be independent (Law et al. 2006). Similarly, parents and teachers may alter the activities that they make available to children of different ages, thus affecting participation diversity (Peny-Dahlstrand et al. 2013). In addition to parental expectations, the differences in participation between older and younger children also reflect their own activity interests and expectations (Little et al. 2014). A further potential interaction with age is disease effect, for example in the case of progressive diseases such as Duchenne Muscular Dystrophy, which results in a decline in children's muscle function and, thus, motor skills and participation as they age (Bendixen et al. 2014).

Therefore, although there are differences between older and younger children's participation, age in itself is not the only cause. Further, the variability of children's participation between types of activities and settings indicates the importance of in-depth exploration of each.

#### 2.4.1.2 Gender

In addition to age, differences between boys and girls also result in a gender effect on children's participation (McConachie et al. 2006). There are examples of studies that report no significant difference between boys and girls in terms of their participation (Liberman et al. 2013). However, findings from research studying the participation trajectories of children with and without coordination difficulties suggest variation between genders in recreational physical activity over time (Cairney et al. 2010). Although boys with probable DCD (pDCD) exhibit an increase in free play participation over time, the same was not true of girls, which decreased, therefore

only partially reflecting the increasing performance skill demands of age associated play activities (Cairney et al. 2010). Conversely, Klaas et al. (2010) report that girls with spinal cord injury tend to participate in a higher number of informal activities in comparison with boys.

The contrasting direction of difference between boys and girls in the above studies may relate to the activities that were of focus. This is reflected in research carried out by Law et al. (2006) that indicates differences between boys and girls in regards which types of activities they exhibit the most participation. King et al. (2013b) similarly report that girls with and without disabilities exhibit greater enjoyment than boys in both groups on skills-based, social and self-improvement activities. Bult et al. (2013) report similar findings in a systematic review that indicates girls participate more in social and spontaneous leisure activities while boys participate more in physical activities.

Research by Ullenhag et al. (2014) also indicates gender differences in diversity of leisure activities and frequency for some activities. While girls participated in more skills-based, self-improvement and recreational activities, boys tended to participate in a greater number of physical activities (Ullenhag et al. 2014). Similarly, female adolescents with cerebral palsy participate in a greater variety of and with more frequency in self-improvement leisure activities than males of the same age (Shikako-Thomas et al. 2013). As with age, differences in participation between boys and girls relate more to types of activities than overall participation scores.

Similar to age, the differences in participation between boys and girls result from developmental trajectories, children's own preferences and environmental expectations (Ullenhag et al. 2014). Although Goltz and Brown (2014) did not find an overall association between age, gender and participation, correlations did exist between individual components of each and children's activity preferences, which may partially explain variance found elsewhere. Schreuer et al. (2014) further report that the main gender effect on children's participation was in the variety of leisure activities in which boys and girls prefer to participate. Although girls had a higher participation preference for self-enrichment activities, boys had more preference for games and sport (Schreuer et al. 2014). These findings also echo the differences in

participation between boys and girls in the study by Bult et al. (2013), indicating the potential influence of preferences within that study.

#### 2.4.1.3 Impairment

In addition to age and gender, research findings suggest that impairment severity influences children's performance skills and, consequently, participation (Parkes et al. 2010, Anaby et al. 2012, Shikako-Thomas et al. 2013, Adair et al. 2015). For example, findings from a large study of 7-13 year old children with cerebral palsy indicate that more severe impairment has an association with reduced participation across settings and domains (Colver et al. 2012). A further study indicates that severity of autism spectrum disorder is associated with children's participation in a variety of leisure areas, particularly for structured activities (Little et al. 2014). Moreover, Anaby et al. (2014) report findings from a study that suggests that, for children with a range of impairments; the complexity of their condition, as indicated by the number of performance skills issues, has a stronger association with participation than do distinct diagnoses.

Conversely, Parkes et al.'s (2010) research suggests that, in comparison with those who have more severe impairment, children who have cerebral palsy with mild motor skills impairments experience more participation restrictions in some activities. This effect may result from the supportive benefit of using mobility aids, such as power wheelchairs, compensating for otherwise restricted mobility of those with more severe motor impairment (Parkes et al. 2010). Similarly, Anaby et al. (2012) report findings from a large population study that indicates children with more severe neurodevelopmental disability have higher participation in recreational activities than those with milder impairment. This may point to a compensatory effect, wherein children with restricted participation in one area adapt to increase their participation in other activities (Anaby et al. 2012).

The sample populations, assessments used for data collection and aspect of participation included in the above studies varies. However, there is consensus that personal characteristics such as age, gender, and impairment severity are associated with children's participation. The influence of personal characteristics varies

according to the interaction with other factors including activity type, children's preferences or performance skills and the social environment. The following sections build upon this knowledge by overviewing literature researching the association between children's participation and the MOHO concepts of volition (2.4.2), habituation (2.4.3), performance skills (2.4.4) and the environment (2.4.5).

### 2.4.2 Volition

Volition encompasses children's underlying motivation for participation, which includes interests, values and awareness of their own abilities that direct the activities that they choose (Kielhofner 2007c). Psychosocial function includes children's self-concept, self-esteem and mental and behavioural functioning, thus closely linked with volition (King et al. 2013b). Children with disabilities are at an increased risk of poor psychosocial functioning in comparison with their peers without disabilities (King et al. 2013b). There is relatively limited research about the influence of volitional concepts on participation. However, there is an indication that children's self-concept and confidence can interact with features of the environment or available activities to affect their participation (Goltz and Brown 2014).

Children's self-concept refers to how they perceive themselves, including roles and behaviours that are important to them (Goltz and Brown 2014). Goltz and Brown (2014) suggest that self-concept contributes to motivational tendencies and report a connection between children's academic self-concept and their participation enjoyment. Further studies indicate that aspects of children's self-concept, including their own attitudes, particularly positive attitudes, have an important influence on their participation (Kanagasabai et al. 2014).

Further, parents indicate concerns about children's self-concept regarding motor skills difficulties, particularly in terms of self-image and the influence of peer pressure (Poulsen et al. 2011). In another qualitative study, parents indicate that their child's disposition, including shyness or reduced confidence, is a key factor that limits their participation (Mei et al. 2015). Further, parents perceive that children's determination to complete activities was an important facilitator of their participation (Mei et al. 2015). Concurrently, children who exhibit particular worries, fears and anxieties

experience less enjoyment in active physical and social leisure activities (King et al. 2013b).

Interests, preferences and values are important predictors and possible precursors of children's participation related to volition (Imms et al. 2016). Children's preferences also link closely with their age, with older children's activity choices different to those of younger children; however, it is important to recognise the influence of environmental expectations (King 2013, Little et al. 2014). As children's participation closely relates to that of their parents and the family context, parental preferences may influence the type of participation that is meaningful to children (Anaby et al. 2012).

Research comparing participation between children with disabilities and similarly aged typically developing (TD) children found that, for both groups, their participation enjoyment and satisfaction positively correlated with psychosocial factors such as hopefulness, effort and sense of coherence (Liberman et al. 2013). Again, this study uses a relatively small sample and thus may not generalise to the wider population (Liberman et al. 2013). However, King et al. (2013b) report similar findings in which athletic competence influences children's participation enjoyment and intensity in physical activities.

There therefore appears to be a connection between aspects of children's volition and their age and participation experiences. What constitutes enjoyment for children participating in one type of activity may differ from that in another, and children differ in the kinds of activities they enjoy (King 2013). When children enjoy activities and experience a sense of competence, it increases their motivation to engage with those activities and thus enhances their participation over time (Lauruschkus et al. 2015). Therefore, increasing understandings of the associations between children's volition and their participation is an important area for future work.

### 2.4.3 Habituation

Habituation refers to a child's ability to "exhibit constant patterns of behaviour guided by habits and roles and fitted to the characteristics of routine temporal,

physical and social environments" (Kielhofner 2007d p. 52). Children's participation occurs across three different settings, demanding of them a variety of roles and responsibilities. However, the influence of specific roles and routines, and children's habit formation within the context of each, is a relatively under researched area. Theoretically, there is a two-way relationship between children's participation and their roles and routines. Roles shape the routines that children follow in daily life, thus providing a structure within which participation occurs (Kielhofner 2007d). Through participation, children are able to fulfil social roles relevant to their life situations; including friend, student, and family member (Piškur et al. 2012).

Perenboom and Chorus (2003) highlight that role fulfilment is a key indicator of children's participation. Children's first major roles are that of child and family member, later including the role of student as they begin to attend school and friend as they engage with others outside of the home context (Kielhofner 2007c). Each role creates expectations for children's daily activities. Therefore, habituation influences participation and requires that they manage a variety of responsibilities, often influenced by key members of children's social environments. The support that children receive from family at home and the peer attitudes they experience at school influence their engagement in social roles (Colver et al. 2012). As the priority shifts from one role or life domain to the other, children's daily time use changes to engage in activities specific to the most relevant role (Ziviani and Muhlenhaupt 2006). Gathering information about how children interact with their daily responsibilities will enhance knowledge in this area.

### 2.4.4 Performance Skills

In addition to personal characteristics, volition and habituation, there is an association between children's performance skills and their participation. Performance skills encompass a range of observable, goal-directed actions required to complete tasks and activities throughout everyday life (Fisher 2006, Kovic and Schultz-Krohn 2013). There are three performance skills categories, motor, social interaction and process skills, that all contribute to a child's ability to interact with activities in their environments and, thus, support participation (Kovic and Schultz-Krohn 2013). Body functions, body structures and underlying capacity all contribute

to children's performance skills; however are themselves distinct factors (American Occupational Therapy Association 2014). Importantly within the context of participation, performance skills are distinct from performance capacity in that the former are observable, goal-directed actions that contribute to task completion (Fisher 2006, American Occupational Therapy Association 2014). Fisher and Griswold (2014) further emphasise the distinction between what a child's body systems do (body function) and what the child does as they interact with the environment (performance skills).

There is a two-way association between performance skills and participation; developing new performance skills and building on existing ones supports children's participation, which in turn contributes to further skill development (Poulsen et al. 2011, Rosenberg et al. 2013a). However, Imms et al. (2016) warn against inferring that an increase in skill equates to an increase in participation. Children's motivation to participate in activities for reasons such as enjoyment or social engagement may precede any increase in skill (Imms et al. 2016). The following sections provide a critical overview of research that reports the influence of each skill area: motor, social interaction, and process skills, individually.

#### 2.4.4.1 Motor Skills

Motor skills relate to the actions that a child performs to interact with objects and move themselves around the environment (Fisher and Griswold 2014). Examples of motor skills include gripping objects, positioning self appropriately to use objects, and walking across level surfaces (Fisher and Griswold 2014). Motor skills therefore allow children to move around their environments to access and use a variety of objects to complete activities. Research indicates that demonstrating such motor skills significantly influences children's participation (Parkes et al. 2010, Bult et al. 2011). Children with reduced motor skills typically experience a greater number of functional difficulties, which in turn restricts their participation in daily life (Raz-Silbiger et al. 2015). However, Kanagasabai et al. (2014) warn about inconsistency in the available evidence as the direction and extent of association between motor skills and participation differ across studies.

One of the challenges in identifying the association between children's motor skills and their participation is the interchangeability of terms within literature, in addition to the lack of distinction between performance skills and body function. For example, the Gross Motor Function Classification System (GFMCS) is one assessment frequently included within participation research studies. The GMFCS is used to identify the child's usual performance of self-initiated movement within home, school or community as observed by health professionals. Kanagasabai et al. (2014) group the GMFCS alongside other measures including the Movement Assessment Battery for Children (MABC) as measures of motor functioning, which they define as "the ability to use the musculoskeletal system to execute a motor task for activity of daily life" (Kanagasabai et al. 2014 p. 1148). Therefore, despite the alternative terminology, the focus on observed performance within own environments suggests that the GMFCS captures performance skills and is a useful measure within the context of participation. For the purpose of consistency, this thesis uses the term 'motor skills' to include observable performance of motor actions alternatively referred to as motor functioning or physical skills within existing research.

Findings from a large European study indicate that reduced fine motor skills and/or gross motor skills including walking ability in CP explain variance in all but one of the included participation domains (Fauconnier et al. 2009). There was no significant association between children's walking ability or fine motor skills and relationships (Fauconnier et al. 2009). Recent studies further indicate that the association between motor skills and participation varies according to activity type. Findings from an integrative review focusing on children with physical disabilities, including CP, DCD and spina bifida, suggest that the impact of motor skills on leisure participation depends on the particular demands of an activity (Kanagasabai et al. 2014). For example, reduced motor skills have more of an impact on active physical activities than sedentary activities (Kanagasabai et al. 2014).

Similarly, in their cross-sectional study, Shikako-Thomas et al. (2013) report that although adolescents with CP do participate in a variety of activities outside of school, the variety was greater and frequency higher in informal activities. Further,

adolescents participated in fewer self-improvement activities and less frequently in physical and skill-based activities than other types (Shikako-Thomas et al. 2013).

Further studies identified within an integrative review also report a connection between motor skills and the variety of informal and physical activities in which a child chooses to participate (Kanagasabai et al. 2014). In addition, Raz-Silbiger et al. (2015) did not find significant associations between leisure participation and motor skills in their study with TD children and children with probable DCD. However, they do report an association between reduced balance motor skills and an increase in sedentary activities that involve little physical movement (Raz-Silbiger et al. 2015). Further, in another study with children with DCD, motor skills were a key characterising factor distinguishing between groups of children with different levels of participation (Poulsen et al. 2011).

In a longitudinal study with children with cerebral palsy, Bult et al. (2013) report that gross motor skills are predictive of children's participation in formal activities. Notably, children's ability to mobilise appears to have an effect on their frequency and extent of involvement in leisure activities (Shikako-Thomas et al. 2013). Adolescents with cerebral palsy who are able to mobilise with or without assistive aids participate more frequently in all activity types, except skills-based leisure activities, than adolescents who are not able to mobilise (Shikako-Thomas et al. 2013). Parkes et al.'s study (2010) further emphasises the interaction, wherein children with lower gross motor skills than the rest of the group but access to mobility aids exhibit higher average participation scores.

Motor skills also include skills related to children's fine movement actions, such as gripping a pencil when handwriting or other activities requiring precision and dexterity. Fine motor skills are among the variables found to have associations with lower participation on multiple domains for children with cerebral palsy (Fauconnier et al. 2009). Handwriting difficulties caused by fine motor skills deficits are also common among children with DCD and feature within research, indicating that they can affect participation at school (Magalhães et al. 2006). In addition, fine motor skills are significant determinants of participation in mealtimes and personal care for children with cerebral palsy (Parkes et al. 2010). This impact on mealtimes and

personal care can then have a knock-on effect on social and leisure participation as requiring assistance with self-care may restrict the activities that are accessible to children (Kanagasabai et al. 2014).

In summary, children's motor skills have a widespread association with their participation in a range of activities and, thus, life situations. The association between motor skills and participation varies across studies, depending on the particular focus; i.e. community, school or home participation. However, there is also an important interaction between children's motor skills and the environment; specifically, the availability of mobility aids reducing the potential restrictive effects of motor skills impairment. Future research will benefit from greater distinctions between children's body functions and motor skills, in addition to ensuring consistency in terminology.

#### 2.4.4.2 Social Interaction Skills

In addition to motor skills, children's social interaction skills can have a significant influence on their participation (Bult et al. 2013). Social interaction skills relate to observable actions that children use during social exchanges, including using socially appropriate gestures, making eye contact and making relevant responses (Fisher and Griswold 2014). Children's social interaction skills enhance their ability to interact with information and with other people (King et al. 2013a, Hilton 2015). Social interaction skills are thus essential for developing quality relationships, enhancing children's understanding of life situations and being able to express their needs (King et al. 2013a). Children can therefore better interact with their environment when they have sufficient social interaction skills and thus influence their participation. As with motor skills, although the definitions overlap, there is interchangeable use of terminology within the literature including communication function, social function and communication skills. For the purposes of consistency, this thesis uses the term 'social interaction skills'.

Findings from a large European study with children with cerebral palsy indicate that social interaction skills are broadly associated with reduced participation (Fauconnier et al. 2009). Concurrently, a more recent systematic review, including studies with

groups of children aged 2-5, 6-12 and 12-18 years, indicates that social interaction skills are positively associated with participation (Bult et al. 2011). More specifically, children's social interaction skills are a strong overall predictor of their informal leisure participation (Bult et al. 2013). Among children with disabilities in a school context, those with reduced social interaction skills have some of the lowest educational participation scores (Mâsse et al. 2013).

In addition, parents express the relevance and importance of social interaction skills to participation, as they are a means through which children are able to indicate their needs and wants (Mei et al. 2015). Asking for help is an important social interaction skill that supports children to enjoy competent participation in their school and community contexts (Hilton 2015). There is a sense in which social interaction skills in terms of expressing need are more important than motor skills, as the former can influence how children are able to cope and respond to restrictions in the latter (Mei et al. 2015). When children can indicate their need for support, it may reduce potential barriers to participation that they would otherwise experience (Mei et al. 2015).

Importantly, the influence of social interaction skills applies to all activities, including those that appear primarily active physical in nature. Research indicates that for children with ASD, social interaction skills are associated with their participation in physical activities (Little et al. 2014). This association indicates that when a primarily physical activity requires children to engage with others, for example team sports, the additional demands prove restrictive for children who have reduced social interaction skills (Little et al. 2014). Similar associations between children's social interaction skills and active physical participation are evident in research with TD children (King et al. 2013b). This may then influence the types of activities in which children with reduced social interaction skills choose to participate (Little et al. 2014). As with motor skills, consideration of activity types and demands will therefore be useful in understanding the association between children's performance skills and their participation.

#### 2.4.4.3 Process skills

Process skills include children's ability to appropriately sequence steps of an activity, select objects appropriate to an activity and demonstrate adaptability to changing situations when problems arise (Kielhofner 2007b, Fisher and Griswold 2014, Rosenberg 2015). Process skills therefore contribute to performance of all activities, thus potentially affecting all aspects of children's participation (Rosenberg et al. 2013a). However, in comparison with the other performance skills there is relatively little research investigating associations between children's process skills and their participation (Rosenberg 2015). Although motor skills are one of the key indicators of developmental coordination disorder, research indicates that this group of children also have significantly different process skills when compared with typically developing children of the same age (Liberman et al. 2013). Children with spina bifida also appear to have reduced process skills when compared with a TD group (Peny-Dahlstrand et al. 2013). Process skills are therefore an important consideration alongside motor skills.

Research indicates a correlation between reduced process skills and participation restrictions (Liberman et al. 2013, Rosenberg 2015). In their study investigating participation of children with mild developmental disabilities (MDD), Rosenberg et al. (2013a) report that process skills are the main predictors of children's participation, more than motor and social interaction skills or aspects of the home, school and community environments. A large study of children with cerebral palsy reports similar findings wherein intellectual impairment, including reduced process skills, is associated with reduced participation across most domains (Fauconnier et al. 2009). A further study with TD children indicates that process skills are a stronger predictor of participation than tests of underlying executive function (Rosenberg 2015).

However, as with other performance skills and personal characteristics, the association between process skills and participation depends on the interaction with other contributory factors. In a study comparing children with mild developmental disabilities and their TD peers, process skills were a key indicator of children's independence and enjoyment in participation, in addition to their parent's

satisfaction (Rosenberg et al. 2013a). The association between process skills and these dimensions of participation was particularly significant among the group of children with MDD (Rosenberg et al. 2013a). Although process skills are an important determining factor of children's participation in the playground, motor skills have greater correlation with participation in the classroom; an environment that may compensate for children's process skills due to teacher input (Peny-Dahlstrand et al. 2013). Therefore, even within the single setting of school, performance skills can vary in their association with children's participation.

#### 2.4.4.4 Summary of Performance Skills

Understanding the association between children's participation and their performance skills is a particular area of interest within research. The majority of studies focus attention on children's motor skills; however, there is a growing body of work investigating process and social interaction skills. One of the challenges in existing research is the lack of distinction between body function and motor skills. In addition, there is overlap and interchangeability between terms in the literature, which requires greater clarity in future work.

Being able to mobilise around their environments is particularly important for children's participation, however mobility aids can compensate for reduced motor skills and thus increase children's participation. Social interaction skills further predict children's participation across all contexts, allowing them to develop relationships, access support and engage in community activities. Although less researched than other performance skills, there is an indication that children's process skills are more predictive of their participation. However, for each skill, findings about the association with participation relates to a specific activity type, setting, or group of children. Further work to consider the interaction of all three performance skills sets and children's environments would enhance knowledge of children's participation. The following section overviews research about the association between children's participation and features of their environment.

### 2.4.5 Environment

The 'environment' most typically refers to the physical and social characteristics of children's immediate surroundings. However, the environment can also include institutional structures, activity demands, financial resources and temporal aspects. Such environmental characteristics shape the context in which children's participation takes place and thus feature within research (Rosenberg et al. 2012, Coster et al. 2013a). Social models of disability emphasise the potentially disabling influence of restrictive environments (Connors and Stalker 2007). Such understandings feed into conceptualisations of participation as arising from an interaction between the person, their environment and the activities in which they engage (Connors and Stalker 2007, Adolfsson et al. 2011, Oliver 2013, Cameron 2014). In the past, there were few empirical studies available to support this notion (Law 2002, King et al. 2013a). However, recent research studies demonstrate associations between features of children's environments and their participation.

Multiple environmental features affect children's participation and restrictions can occur within and across multiple settings (Law et al. 2006). Children's participation varies across geographical locations, immediate physical settings and because of the social or institutional context (Peny-Dahlstrand et al. 2013, Anaby et al. 2014). The influence of environmental factors on children's participation varies across settings and according to interactions with other factors, including personal characteristics and performance skills (Anaby et al. 2014, Goltz and Brown 2014).

Anaby et al. (2014) report a trend of environmental factors having a direct effect on children's participation across all settings, emphasising the contextual nature of participation. Children themselves relate their experience of disability to the social environment, including awareness of differences between themselves and peers, others' attitudes and material barriers (Connors and Stalker 2007). In addition to the social environment, in comparison with parents of non-disabled children, parents of children with disabilities report more physical environmental barriers to children's participation at home (Law et al. 2013). Similar findings are evident when comparing parents' reports of features of the school environment restricting participation for children with disabilities (Coster et al. 2013a). Overall, the environment appears to

have the greatest impact on children's participation frequency and involvement within the community, perhaps related to the complexity of that context (Anaby et al. 2014).

Creating a supportive environment is therefore essential in ensuring participation of children with disabilities and providing them with opportunities to realise their full potential (UNICEF 2013). Identifying environmental supports or restrictions can help to prevent health conditions, reduce impairments and, ultimately, enhance children's participation outcomes (World Health Organization 2011). The general association between the environment and children's participation is therefore clear; however, it is useful to understand how specific environmental features interact with children's own characteristics and performance skills. The following sections overview aspects of the environment that influence children's participation; including activity types, physical supports and barriers, and social support and acceptance.

#### 2.4.5.1 Activity Types and Demands

The type of activity and associated demands relate closely to environmental settings and are recurrent features in research studies investigating children's participation. In their study with children with ASD, Little et al. (2014) note that activities that appear primarily physical, for example team sports, may incorporate additional social demands that create challenges for children with ASD. Similarly, Kanagasabai et al. (2014) report findings from an integrative review that indicates the impact that motor skills have on children's leisure participation depends on the particular performance skills required for an activity. Further, within a large study of children with neurodevelopmental disabilities, differences between children's participation were most notable in school-based activities in comparison with leisure activities outside of school (Mâsse et al. 2013).

Ullenhag et al. (2014) highlight that children with disabilities participate less in informal and unorganised activities than they do in formal and organised leisure activities. Concurrently, when examining the participation of boys with DCD, structured community activities are advantageous, resulting in better participation than unstructured activities (Poulsen et al. 2011). Unstructured activities place a

greater demand on children's performance skills and children with disabilities therefore tend to participate in less complex or more sedentary activities (Peny-Dahlstrand et al. 2013). However, having access to a variety of activities is important for children's participation (Schreuer et al. 2014, Lauruschkus et al. 2015). Therefore, increasing knowledge of the interaction between activity types and performance skills sets relevant to each setting and compensatory supports may provide richer understandings of the contextual nature of children's participation. Such understandings can then inform future work to improve children's participation.

#### 2.4.5.2 Physical environment

Research indicates an association between physical features of the environment and children's participation. There is an indication that where a family lives affects children's participation, although this partially reflects socioeconomic factors as well as the physical environment (Forsyth et al. 2007, Fauconnier et al. 2009). However, geography does affect the school that children can attend and, thus, their educational participation (Ziviani and Muhlenhaupt 2006). Similarly, children's experience of travel to and from school can influence their participation throughout the whole day (Law et al. 2006). Once at school, physical features of the environment may then directly influence children's participation. For example, children transitioning to high school face larger environments that require extra motor skills to navigate (Egilson 2014).

Being able to negotiate the environment is important for children's participation, with reduced accessibility associated with participation restrictions (Anaby et al. 2014). A supportive physical environment in the home context is associated with an increase in children's participation in this setting, particularly in regards to personal care and feeding (Colver et al. 2012). Although motor skills have an important role in children being able to complete activities, the availability of supports including mobility aids such as walkers or wheelchairs can compensate for restrictions in children's motor skills (Parkes et al. 2010). There is research investigating the influence of the environment on participation of children with physical difficulties; however, it is the social environment that receives the most attention (Anaby et al. 2014).

#### 2.4.5.3 Social environment

Participation does not necessarily require social interaction; however, it remains true that children's social environments have an important influence (Maxwell et al. 2012, Palisano et al. 2012). Children indicate that they value togetherness, which influences their enjoyment of activities; for example engaging in physical activities with family or peers (Lauruschkus et al. 2015). There is also a link between activity types and the most desirable social environment for participation. For example, adolescents with cerebral palsy tend to participate in social, skill-based and active physical activities with others, while they engage with self-improvement activities alone or with close family members (Shikako-Thomas and Law 2015).

For children with reduced motor skills who depend on others for mobility, a lack of support within their social environment can be a significant barrier to their participation (Anaby et al. 2014). Children who require additional support to complete their self-care or engage with activities have restricted access to community participation if that support is not available (Ullenhag et al. 2014). However, where support is available this should not affect the way that children's participation is measured; i.e. those receiving support should not have their participation measured as less than those who do not, as is the case in the Assessment of Life Habits (Life-H) (Fauconnier et al. 2009).

The family context has an important influence on children's participation, however the impact varies depending on the type of activity and aspect of participation measured (Anaby et al. 2012, Mâsse et al. 2013). Important environmental supports for children's participation at home include adequate money and parents having sufficient time to give support (Law et al. 2013). A further key aspect of the family context is parental education, which Little et al. (2014) found has a significant positive association with children's participation, perhaps reflecting parents' ability to access additional resources. Research by Ullenhag et al. (2014) further suggests that having a mother with university level education was a predictor of higher participation in social and physical leisure activities. Family factors such as income, parental self-efficacy beliefs and parental involvement in arranging activities also

have positive associations with children's participation (Anaby et al. 2012, King et al. 2013b).

Conversely, Rosenberg et al. (2013a) report a negative correlation between maternal self-efficacy beliefs and children's independence. The negative correlation may suggest that parents with strong self-efficacy beliefs adjust their behaviours to accommodate their child's needs, restricting their independence (Soref et al. 2012, Anaby et al. 2014). Recent findings from a qualitative study with parents report recognition that in their eagerness to support their child and remove challenges, they inadvertently restrict their participation (Mei et al. 2015). Part of the influence of parental self-efficacy may therefore be due to an increased awareness of and heightened sensitivity to responding to their child's difficulties (Rosenberg et al. 2013a).

Beyond the family context, the influence of the social environment is also evident in children's participation at school. Attitudes of therapists, teachers and classmates have associations with children's participation in relevant social roles and responsibilities (Colver et al. 2012). Receiving support from friends and classmates has a positive influence on children's participation (Anaby et al. 2014). Further, although it does not necessarily increase the diversity or intensity of children's participation, having supportive friends increases their enjoyment of activities (King et al. 2013b). Similarly, when children with disabilities experience social acceptance, it is associated with increased enjoyment of social and skills-based activities outside of school (King et al. 2013b).

Children with disabilities exhibit increased participation in skill-based activities when they do not experience social acceptance from their peers, indicating that they select specific activities to avoid negative experiences while maintaining participation (King et al. 2013b). In addition, negative attitudes in response to children's impairments can result in others excluding a child from opportunities for social participation (Mei et al. 2015). Consequently, there are examples of children choosing to not use assistive devices if they felt that the use of such an aid would marginalise them (Egilson 2014).

Attitudes of those in children's social environments influence their participation across multiple contexts, with the influence of different people varying depending on the setting (Colver et al. 2012, Anaby et al. 2014). For example, while attitudes of family and friends have an association with children's participation in roles relevant to their responsibilities and recreation, attitudes of teachers and therapists have a greater influence on school participation (Colver et al. 2012).

In summary, physical and social features of the environment interact with children's own characteristics to shape their participation. Activity demands, social support, physical accessibility and parental education all have associations with children's participation. However, the impact that any one environmental feature has on a child's participation generally depends on its interaction with the child's own characteristics and performance skills. There is therefore a need for methods to capture and disentangle the complexity of factors affecting children's participation.

## 2.5 Summary of Interacting Factors

Participation is a complex construct and one that presents challenges to research. Current conceptualisation of participation includes consideration of its distinction from activity performance. Complexities in conceptualising children's participation include the variety of settings in which they live out their day-to-day lives and the influence of parents or teachers on their participation in each setting. The review of existing research into children's participation highlights the interaction of potential influences. Table 2-1 summarises key points from the discussion above.

Multiple factors affect children's participation; however, the particular effect depends on the interaction between personal characteristics, skills and the environment (Parkes et al. 2010, King et al. 2013b). Differences between age and gender groups are apparent in some contexts; however, the difference varies according to the type of activity, the environment and other child-specific characteristics (Klaas et al. 2010, Coster et al. 2013a, Ullenhag et al. 2014). Performance skills also have a significant association with participation, although variability in this area makes the evidence less conclusive. Notably, accessing mobility equipment can have a compensatory effect wherein children with severe motor impairment, in comparison with children

with less severe impairment, have higher levels of participation (Parkes et al. 2010). An accurate understanding of children's participation will reflect their whole life and thus it is important to take this into consideration (King et al. 2013b).

According to existing research, no single factor fully explains variance in children's participation. Combining influencing factors as a group of individual aspects only partly explains variations in children's participation, thus it may be the combined impact of an interaction of factors that explains the full variation (Schreuer et al. 2014, Ullenhag et al. 2014). However, some factors are more influential than others are depending on the activity type, setting and participation dimensions. This influence of multiple factors indicates that there is more than one pathway towards achieving successful participation (Adair et al. 2015). Ecological models that encompass child characteristics and environmental factors explain variance in children's participation, indicating that it is the interaction of factors, rather than individual characteristics, which determines children's participation (Rosenberg et al. 2012). It is important that attempts are made to understand and disentangle the interaction between factors that research indicates influence children's participation.

Differences between research studies, for example the focus on specific dimensions of participation, create further challenges in comparing findings across studies (de Kloet et al. 2015). This is a particular challenge that authors of systematic reviews in the area of investigating children's participation report and indicates the need for a more synchronous approach to participation measurement.

Given the centrality of participation to children's health, well-being and development, it is essential that it becomes the focus of research efforts (Rosenberg et al. 2013a). Assessing participation, at individual and wider population levels, is essential for understanding the impact of disabilities on children's lives (Magalhães et al. 2006). In particular, it is important to develop means of assessing children's participation in a way that is age appropriate and relevant to their own context (Rosenberg et al. 2013a). Recurring challenges in current research regarding the measurement of children's participation indicate the necessity of appropriate assessments for this purpose (Adair et al. 2015). The following chapter explores the

place of assessment in practice and research, with a particular focus on the relevance to enhancing understandings of children's participation

**Table 2-1 - Summary of personal factors and environmental features influencing children's participation**

| | |
|---|---|
| Personal characteristics | ○ Age: younger children participate in a greater diversity of activities and more intensely in physical activities. Older children and adolescents participate more intensely and frequently in complex or socially based activities.<br>○ Gender: boys participate more in physical leisure activities, girls more in skills-based, social and recreational leisure activities.<br>○ Age and gender are also associated with children's preferences, which may explain the influence with participation |
| Volition | ○ Children's self-concept contributes to motivation for participation<br>○ Competence is associated with children's enjoyment of activities<br>○ Preferences influence children's participation choices, associated with participation diversity |
| Habituation | ○ Habituation is currently an under-researched area within childhood participation<br>○ Children's social roles shape their daily participation routines which, in turn, support their participation |
| Motor skills | ○ The impact of motor skills on participation varies according to the type of activity and setting in which children engage<br>○ Restriction in motor skills reduces the variety of activity types in which children participate<br>○ Motor skills restriction is associated with reduced participation, except where environmental adaptations support mobility<br>○ Children's fine motor skills influence their self-care activities and leisure participation |
| Social interaction skills | ○ Increased social interaction skills are associated with an increase in participation across leisure and school activities<br>○ Reduced social interaction skills can restrict children's participation in physical activities if there is a demand for social interaction (e.g. team sports) |
| Process skills | ○ There is a correlation between reduced process skills and participation restrictions<br>○ There are examples of process skills being a stronger predictor of participation than other performance skills or the environment<br>○ Process skills are associated with participation across multiple domains and settings, including school |
| Environment | ○ Activity type and setting are associated with children's participation – interacts with personal characteristics and performance skills<br>○ Physical environment influences accessibility to participation; e.g. getting into friends' houses, availability of suitable toileting facilities in community<br>○ Social environment has a key association with children's participation; parents shape children's routines and peer relationships at school and in the community enhance enjoyment.<br>- Parental education, self-efficacy beliefs and family resources are all aspects of the social environment that are associated with participation. Parents with positive self-efficacy beliefs can over-compensate for restrictions in children's performance skills and inadvertently restrict independence. Attitudes of others can influence family activity choices and thus participation. |

# Chapter 3 - Assessment

## 3.1 Introduction

Children with disabilities face additional challenges to those ordinarily experienced during childhood (Bedell et al. 2011). However, previous approaches to conceptualising and responding to disability are no longer sufficient to address the challenges that children with disabilities experience. Recognition that disability arises from an interaction between the person and their environment led to a departure from the exclusive use of either a social or a medical model of disability (Cameron 2014, Finkelstein 2014). In recent years, attention has turned to improving the lives of persons with disabilities, including children, by enhancing their participation. Acceptance of participation in daily life as the most important outcome for children is shaping healthcare practice and research in the area of paediatrics; however is yet to reach full realisation (Coster and Khetani 2008, Raghavendra 2013).

Children's lives are complex with many interacting factors affecting their daily life (Kielhofner 2007b, Palisano et al. 2012). Therefore, discussions relating to disability models and conceptualisations of participation also reflect this complexity (Palisano et al. 2012). Recognition of the complexity of children's participation reflects in conceptual practice models that describe the interaction between aspects of children, their environment and activities with which they engage (Kielhofner 2007b). Increasing knowledge about children's participation and restrictive or supportive factors is important for the advancement of healthcare knowledge and practice (Granlund 2013, Raghavendra 2013). It is therefore important to take theoretical understandings and developments beyond mere knowledge to influence the practice of professionals working with children with disabilities (UNICEF 2013).

Recent development of theoretical understandings within healthcare influence current approaches to assessment. In particular, medical and social models of disability, conceptualisations of participation and recognition of the importance of healthcare that is evidence-based and family centred have been influential in the area of assessment (Wilson 2005, Kennedy et al. 2013). In particular, there is now a focus

on the values of ecological assessment as an overarching approach that focuses on gathering information that is a true reflection of children's lives (Mandich and Rodger 2006, Watson and Pennington 2015). There is a variety of potential methods to carry out ecological assessment, including observation, interview or questionnaires.

Assessing children's participation involves gathering comprehensive information about their engagement in relevant everyday activities within the context of their own environment (Missiuna et al. 2006). Synthesising patterns of strength and areas of concern in children's participation, as well as supports or barriers in their surrounding environments, supports the gathering of comprehensive information (Stewart 2010). Such comprehensive assessment of children's participation links naturally with intervention and has increased relevance to children and their families (Wilson 2005).

This chapter will explore the above discussions in detail, including the importance of assessment within the context of current healthcare priorities (section 3.2), an overview of the two main overarching approaches to assessment (section 3.3) and factors to consider when selecting assessments for use in research and practice (sections 3.4 - 3.7).

## 3.2 Importance of Assessment

When knowledge about children's participation and contributory factors is improved, it will provide a basis for addressing restrictions as well as enhancing supports (UNICEF 2013). Assessment is a foundational feature of the healthcare process that consequently affects the effectiveness of input (Diamantis 2008, Kramer et al. 2009, Wallace and Davies 2009). Healthcare professionals use assessment information about children's participation to guide their clinical judgements, therapy goals and intervention plans (Diamantis 2008, Wallace and Davies 2009). Assessment also has an important purpose in research, where it serves as a means to gathering information about groups or populations and measuring intervention outcomes.

Assessment can occur as a single event; however, it is more often an ongoing process of gathering and evaluating information (Wallace and Davies 2009). There are

multiple approaches and methods to carrying out assessment, with the client's context, professional's experience and clinical setting all affecting which is the most appropriate. The assessment approach that is used has a significant impact on the quality of information that it is possible to gather (Brown 2012b). Therefore, it is important to establish a culture of high quality, participation-focused assessment. Crucially, therapists and researchers can then use assessment to take steps to identify and support those children at risk of restricted participation (Bedell et al. 2011). In addition to its relevance to understanding children's participation, the following sections explore the importance of assessment to person-centred practice (3.2.1) and evidence-based practice (3.2.2).

### 3.2.1 Assessment and Person-Centred Practice

Every child who has a disability is unique in terms of both his or her individual personhood and the context within which he or she lives (Tam et al. 2008). Recognition of the unique nature of every person is shaping healthcare research and practice, with an increasing focus on the concept of person-centred practice (Wilson 2005). Person-centred practice is particularly complex in paediatrics as input extends beyond working solely with the child to include their family (Porter and McKenzie 2000). Recommendations therefore generally point to viewing the 'client' as the child and their family, thus the term 'family-centred practice' is often used (Tam et al. 2008, Kennedy et al. 2012).

Within the context of assessment, family-centred practice recognises the importance of gathering information that is a true reflection of individual children (Adams 2007, Chevignard et al. 2012). Further, family-centred assessment recognises the essential nature of the family's perspective and strives to include these views within the information gathering process (Adams 2007). Ultimately, family-centred assessment includes consideration of the family's context, needs and goals, leading to their inclusion in intervention planning (Wilson 2005). The impact of family-centred practice is therefore twofold; ensuring that the information reflects families' contexts, and prioritising family contributions within the assessment process. Both of these impacts of family-centred practice can contribute to quality clinical judgements and a stronger basis for clinical decisions.

Adopting family-centred principles within assessment is also important in terms of creating a foundation for collaborative working in practice (Adams 2007, Magrath 2015). Following a paradigm shift in relationships between therapists and parents, there is now an expectation that health professionals work collaboratively with families (Porter and McKenzie 2000, Rosenberg et al. 2013b). Children are dependent on their families for provision of care and support, therefore it is crucial that they are actively involved in the assessment process (Franck and Callery 2004). Collaborative working recognises that families and professionals both have valuable contributions to make to the healthcare process (Porter and McKenzie 2000, Rosenberg et al. 2013b). Actively involving family in assessment and seeking to understand children within that context helps to create a basis for collaboration throughout the intervention process (Eriks-Brophy 2014).

Within research, family-centred approaches to assessment can also enrich the data that it is possible to collect (Dunlap et al. 2001). Incorporating parents' rich insights into children's participation within research may enhance knowledge about the intricacies that influence children's daily lives (Chevignard et al. 2012). Existing research includes examples of collecting information from parents about their child's participation and such approaches are useful. Multiple studies include quantitative approaches with large samples of data, indicating that families' perspectives can be practically and usefully incorporated into large scale, quantitative research that provides contextualised information into children's participation (for example Fauconnier et al. 2009, Rosenberg et al. 2012, Soref et al. 2012, Coster et al. 2013a, Law et al. 2013, Lyons et al. 2016).

### 3.2.2 Assessment and Evidence-Based Practice

In addition to family-centred practice, there is a crucial two-way link between assessment and evidence-based practice. In the field of paediatrics, evidence-based practice highlights the need to integrate professional experience with research evidence and information from the family's perspective (Taylor 2007, White 2012). To this end, assessment can support evidence-based practice by creating an opportunity for gathering information from the family. This information gathering may be of particular importance within the context of participation, as children's lives

and, thus, participation closely relate to that of their families (Law et al. 2013, Liberman et al. 2013). Therefore, involving families in the information gathering process supports evidence-based practice by providing richer insights into the contexts surrounding children's participation.

Evidence-based practice also involves integrating research evidence into practice. Researchers can use assessments in data collection to increase understandings of particular populations or evaluate intervention outcomes (Kielhofner 2006b, Hack and Gwyer 2013). Much of the existing research about children's participation uses assessment as a means to identify characteristics or aspects of the environment that influence their participation (Bult et al. 2013, King et al. 2013c, Law et al. 2013, Peny-Dahlstrand et al. 2013, Sylvestre et al. 2013, Kolehmainen et al. 2015). Such studies then contribute to theory development surrounding participation.

As interest surrounding participation is growing, there is a need for quality assessment that supports knowledge development. In addition to research studying variables affecting children's participation, researchers may also use assessments to measure the effectiveness of particular interventions aimed at enhancing children's participation. However, there are fewer examples of this kind of research currently available (Adair et al. 2015).

## 3.3 Overarching Approaches to Assessing Children's Participation

There is a variety of potential methods of assessment within paediatrics; however, there are two overarching approaches (Adams 2007, Brown 2012b). One approach, referred to as an ecological approach, emphasises assessment that reflects real-world functioning (Chevignard et al. 2012). An ecological approach therefore focuses on gathering information about children's general participation (Brown 2012b). In contrast, the component-focused approach follows a different process whereby the initial focus is on identifying distinct aspects of children's underlying capacity or performance skills thought to restrict their participation (Brown 2012b). Both approaches have favourable aspects and the goal is similar; to gather information about children to guide the intervention process or generate research evidence (Wallen et al. 2013). However, the underlying theories, related research literature and

processes of each approach differ markedly. This section explores both approaches, with consideration of their similarities and contrasts, leading to a conclusion about appropriate approaches for measuring children's participation.

### 3.3.1 Underlying Theory

Models and perceptions of disability influence the different underlying theories of component-focused and ecological assessment approaches. The medical model of disability emphasises the impact that body components or capacities have on a child's ability to perform activities according to their chronological age (Mandich and Rodger 2006, Rosenberg et al. 2013b). The assumption within the medical model is that having underlying capacities or body functions will result in successful performance and, consequently, participation (Mandich and Rodger 2006, Brown 2012b). Adoption of the medical model therefore tends to result in the use of component-focused assessments (Rosenberg et al. 2013b).

Component-focused assessments concentrate on identifying strengths and weaknesses within underlying body function or performance skills, particularly those thought to be pre-requisites of participation (Brown 2012b). Body function and performance skills limitations can contribute to a poor fit between children and activity demands; therefore component-focused assessments support identification of factors restricting children's participation (Law et al. 2013). However, as stipulated in contemporary models of disability, impairment is often not the sole limiting factor of children's participation.

Alternatively, ecological assessment approaches have their basis in systems frameworks and client-centred practice (Mandich and Rodger 2006). In particular, ecological approaches are informed by theories that define development "according to the multiple, cooperative systems that make up the developing child, and their interaction with the task and the constraints of the environment" (Wilson 2005 p. 815). Such perspectives of development reflect current definitions of disability as an interaction between the person and their environment (Colver 2009). Ecological assessment approaches are therefore increasingly gaining favour and are relevant to better understanding a concept as complex as participation.

There are benefits to identifying body components and capacities that influence children's participation; however, this is most effective alongside understanding other influencing factors such as children's contexts and associated environments (Kramer et al. 2009). Discontent with the social model of disability arose due to the lack of consideration of underlying capacities that can, in interaction with the environment, influence children's participation (Connors and Stalker 2007, Egilson 2014). Similarly, discontent with component-focused assessment approaches relate to undue focus on capacity rather than engagement in life. Ecological assessment approaches are therefore relevant to understanding children's participation.

### 3.3.2 Assessment Process

In addition to underlying theories, component and ecological approaches differ in the process of assessment. With a basis in hierarchical theories, the component-focused approach lends itself to use of standardised assessment procedures (Kennedy et al. 2012). Standardised assessment protocols typically involve performance of specific tasks that require execution of certain performance skills within a controlled environment (Kennedy et al. 2012). Assessment administrators then use scoring systems to identify whether a child's performance is at the expected level or displays deficits (Kennedy et al. 2012, Purse and Gardner 2013). However, there is limited evidence of a causal relationship between capacity factors, such as visual motor integration, and activity performance (Chevignard et al. 2012, Wallen et al. 2013). Improving a child's capacity does not necessarily enhance their participation, thus only focusing on underlying performance or deficits in component-focused assessment is problematic (Chevignard et al. 2012, Wallen et al. 2013).

The standardised protocols associated with component-focused assessment exhibit strengths and weaknesses. On one hand, the strict test procedures can provide a clear framework within which to carry out assessment, thus reducing the potential influence of rater bias (Brown 2012a). However, raters may adapt the assessment to suit a particular child, which, although child-centred, invalidates data produced by standardised assessment (Watson and Pennington 2015). In addition, tasks used to identify discrete performance skills within standardised assessments, such as peg-board tasks in fine motor skills assessments, may poorly reflect those activities in

which a child chooses or is required to engage on a daily basis (Kennedy et al. 2012, Kennedy et al. 2013). Therefore, although useful in highlighting child factors that may limit participation, such assessments do not provide a true reflection of children's involvement in everyday life (Brown 2012a).

The potential to objectively detect and quantify underlying impairments that may limit participation is a strength of impairment or performance skills-focused assessment approaches (Coster 1998, Purse and Gardner 2013). Children's participation is influenced by a variety of factors including personal characteristics, environmental features and the demands of activities or situations in which they engage. Research indicates the significant association between children's performance skills and their participation. An example of such research is Raz-Silbiger et al.'s study which, in addition to a participation assessment, used the Movement Assessment Battery for Children-2 (MABC-2) which is a norm-referenced test designed to screen for DCD by measuring motor skills.

Component-focused assessments therefore have some benefit in supporting a detailed understanding of performance capacities or body components in which children experience weaknesses (Law et al. 2013, Watson and Pennington 2015). However, by nature of focusing exclusively on underlying capacity, rather than activity in context, component-focused assessments do not measure children's participation (Maxwell et al. 2012). Further, the procedures required by component-focused assessments often do not provide scope for understanding other aspects of the participation interaction; namely, the environment and activity demands (Darrah et al. 2011, Brown 2012a). Therefore, although component-focused assessments can aid identification of factors affecting children's involvement in daily life, they cannot themselves fully capture or explain the complexity of children's participation.

Certain contexts or situations may lead to the use of standardised assessments that focus on underlying capacity and performance skills; however, this should not be to the neglect of understanding children's participation in daily life (Kramer et al. 2009). Criticisms of component-focused assessments emphasise the poor link between children's test scores and their everyday life activities (Schott et al. 2014). Indeed, dynamic systems theory of development indicates that there may be multiple

ways that a child can successfully complete an activity, without there necessarily being a single 'correct' method as is often expected within component-focused assessments (Berk 2013).

In contrast to component-focused approaches, ecological assessment involves gathering information about children's involvement in everyday activities and life situations (Brown 2012b, Wallen et al. 2013). Inherent to ecological approaches is development of an overarching profile of a child's participation in activities that are relevant to their life context and with consideration of environmental influences (Bedell et al. 2011, Marshall and Lewis 2014). This approach provides a basis from which to address a child's participation and, if need be, additional steps can be taken to identify contributory factors not already detected in an ecological assessment.

Richer understandings of children's participation are possible when based on comprehensive information about their daily life (Wallen et al. 2013). It is important to identify aspects of children's personal characteristics and environments that affect their participation to inform attempts to minimise barriers and maximise supports (Bourke-Taylor and Pallant 2013, Mâsse et al. 2013). The surrounding environment specific to each setting can support or restrict the extent to which children are able to make the most of those opportunities. However, there is relatively little research investigating the differences in children's participation across multiple settings (i.e. home, school and community).

Family-centred practice is a priority concept within paediatrics (Wilson 2005, Tam et al. 2008). Involving parents during assessment then enhances communication throughout therapy input (Adams 2007, Eriks-Brophy 2014). In addition, as consistent experts in children's lives, parents are well equipped to offer relevant information and to ensure implementation of therapy plans (Dunlap et al. 2001, McDowell et al. 2015). However, standardised assessments as typically associated with component-focused approaches offer limited scope for integrating parents' perspectives.

There is some suggestion that it is possible to improve the ecological validity of standardised, component-focused tests (Lo et al. 2015). However, it remains

important to assess children's behaviour or participation across more than one time point, in order to gather contextual information (Darrah et al. 2011). When component-focused tests are used, it may then be beneficial to do so within the context of first having completed ecological assessment of children's participation across a variety of environments (Wallen et al. 2013). Ultimately, within a culture of enhancing children's participation, the sole use of component-focused assessments risks reducing the effectiveness of practice and research (Watson and Pennington 2015).

### 3.3.3 Summary of Assessment Approaches

Therapists can effectively plan interventions, and researchers draw conclusions, when they base their decisions on comprehensive information about children's participation in the context of their natural environments. There are two primary overarching approaches to assessment: ecological and component-focused approaches. Both approaches have particular benefits and there are examples of each within existing participation research studies, including several larger scale studies that have been instrumental in informing knowledge about children's participation. Component-focused approaches are useful in identifying particular features of a child's underlying capacity or performance skills that restrict their participation.

Measuring capacity apart from context, there is a limit to how far component-focused approaches can provide insight into children's real participation. Assessing children in an ecological manner improves understandings of their participation within the context of the environmental supports or barriers that they experience on a daily basis. It is important to identify aspects of a child's environment that affects their participation to support removal of barriers and enhancement of supports. In this sense, ecological assessment approaches are both theoretically valid and clinically useful.

Importantly, by measuring children's participation within the context of their everyday life, ecological approaches result in assessment that is explicitly meaningful to the family. Within the context of family-centred practice, ecological approaches provide a useful lens for understanding a child within the family context and

potential implications for practice (Beckman 1996). In addition, following an ecological approach to assessment captures the complexity of factors that are associated with children's participation. These strengths of ecological assessment allow clinicians to be responsive to families' needs and contexts. Ecological assessment can therefore support family-centred practice and enhance evidence about children's participation useful for further progressing work in this area. The following section overviews methods for carrying out ecological assessment.

## 3.4 Assessment Method Considerations

Gathering accurate information is foundational to practice and research, therefore it is crucial that appropriate assessment methods are available for this purpose (Chisholm and Schell 2014). The approach adopted and methods used when carrying out assessment influence the quality of resulting information (Brown 2012b). It is therefore imperative to ensure that assessment methods reflect the purpose of the information that they are intended to gather. Ensuring optimal participation is now a research and practice priority within the area of paediatrics (Colver 2009, Granlund 2013, Imms et al. 2016). Therefore, although assessments that identify problematic body components and capacities offer some benefits, it is pertinent to begin with an overarching profile of a child's life such as ecological approaches make possible (Bedell et al. 2011).

As the goal of paediatric research and practice is to enhance participation, the continual use of impairment-focused assessments suggests a potential deficit that warrants further attention (Watson and Pennington 2015). The use of ecological assessment approaches provides a useful solution to address this deficit. However, carrying out ecological assessment is complex and uncertainty exists regarding the best methods (Coster and Khetani 2008, Chevignard et al. 2012).

An ecological approach to assessment aligns particularly well with current conceptualisations of participation. However, within an ecological approach there is a variety of available assessments and resources available to gather information. Determining the suitability of a particular method includes consideration of each child's situation, the professional's skills and experience and the context of the

particular health service or research body (Kramer et al. 2009, Thorley and Lim 2011, Magrath 2015). The following sections include exploration of each of these factors.

The context and purpose of using assessments with a particular child or sample of children is an important consideration (Kramer et al. 2009, Thorley and Lim 2011). In practice, this means taking steps to 'match' assessments to each individual child that a clinician works with (Kramer et al. 2009). Some published assessments are designed for use with particular groups or children with specific diagnoses and should only be used as such to avoid invalidating the resulting information (Watson and Pennington 2015). If a diagnosis is known to result in particular consequences it can be useful to target assessment accordingly (Kielhofner and Forsyth 2007). Conversely, within research where a heterogeneous group of children are included within the sample it may be that it is most appropriate to select an assessment that has a broad target group.

Research and practice contexts also influence which assessment is the most appropriate (Kramer et al. 2009). Key influencing factors include local policy requirements, service structures and resource availability (Kramer et al. 2009, Brown 2012b). National and local policy issues can each have a particular influence on the assessment approaches that are possible and the extent of influence will depend on the service area (Brown 2012b). Resources include the availability of assessments or access to the time and space needed to utilise certain methods (Kramer et al. 2009). The amount of time and effort taken to complete an assessment can reflect the comprehensiveness of information required; however, it is important to balance this with the reality of increasing resource constraints (Kielhofner and Forsyth 2007). Similarly, research protocols often have time constraints, strict funding limits and minimum sample sizes that are required to give findings sufficient weight as evidence.

As such, if an assessment is particularly time intensive, the resource impact may outweigh benefits of comprehensive content (Brown 2012b). Further, if a self-report assessment is overly lengthy or complex the resulting burden on respondents can hinder full completion (MacDermid et al. 2014). Although within practice there may then be the opportunity to supplement the information during meetings with the

family, in a research context incomplete assessment has the effect of increasing the amount of missing data. Funding has a significant impact in healthcare practice and research, thus there is need for judicious and accountable use of assessment resources (Brown 2012b).

## 3.5 Using Ecological Assessment to Measure Children's Participation

Following an ecological approach to measuring children's participation usually begins with gathering broad information to develop an overarching profile (Brown 2012b). In order to develop an overarching profile McConachie et al. (2006) recommend identifying children's participation in activities essential for survival, those that contribute to child development, educational participation and discretionary participation. From the basis of an overarching understanding of a child's participation, therapists or researchers can establish how the particular demands of their environment and own characteristics support or restrict the child's participation (Purse and Gardner 2013). Due to the complex interaction surrounding participation, it is important that assessments capture as many influencing factors as possible. Kielhofner (2007b) suggests that five broad categories of factors affect participation:

- Person factors specific to the individual
- Activity features or demands
- Physical environment
- Social environment
- Availability of services and resources

To address the impact of the above factors on participation, an ecological approach to assessment involves identifying the impact of the physical environment and social interactions between children, their significant others and peers (Lim and Rodger 2008). Due to the range of influencing contextual factors such as activity demands and the physical, social and institutional resources it is therefore beneficial to have a comparison across different contexts in which children participate (Coster 1998). Measuring participation in only one setting limits the extent to which it is possible to understand the influence of context in comparison to other contributory factors (Coster and Khetani 2008).

Observation is one method of carrying out ecological assessment of children's participation (Marshall and Lewis 2014). Observation may occur in a clinic-based setting however, in the context of measuring participation; assessment is more desirable within children's own environments. Assessing children in this way supports an understanding of how they interact with their environment and the influence of other contributory factors (Marshall and Lewis 2014). However, in order to gather sufficient information, observation requires a substantial time commitment, which can prove prohibitive (Marshall and Lewis 2014). The potential resource impact needs to balance with the quality of information that it is possible to gather during observation (Kielhofner and Forsyth 2007).

Research with children with and without mild developmental disabilities suggests that therapists' observations of activity performance correlates well with scores on standardised component-based assessments completed by children (Rosenberg et al. 2013b). However, there was no significant correlation between therapists' observation of performance skills and parents' reports of children's participation, despite known associations between the two constructs (Rosenberg et al. 2013b). In contrast, parents' reports of performance skills had small to moderate significant correlations with their reports of children's participation. There is a limit to how far therapists or researchers can understand children's participation based on observation alone (Porter and McKenzie 2000). In addition, parents may be in a better position to report on children's performance skills within context. It is therefore valuable to include perspectives of significant members of a child's life to develop a comprehensive understanding of their participation.

Developing a comprehensive understanding of children's lives is an essential basis of enhancing their participation. Self-report or proxy-report information is a valuable assessment method for use within healthcare and one that is increasing in popularity (Chevignard et al. 2012, Kennedy et al. 2012). Including the perspectives of children and significant members of their social life enhances the information that therapists or researchers can gather (Thorley and Lim 2011, Lo et al. 2015). Including these perspectives ensures that the assessment profile reflects children's participation

across a longer period than is possible by observation or clinical assessment (Schott et al. 2014).

Accurate judgements about children's participation are more likely when founded on an assessment profile that is a true reflection of their life. Such information will incorporate assessment of children across multiple contexts in order to understand the interacting factors that influence their participation (Coster and Khetani 2008). Proxy-report assessment methods provide an effective approach to gathering comprehensive information that is reflective of children's day-to-day participation (Lo et al. 2015). Much of the existing research investigating children's participation utilises proxy-report assessments (for example Coster et al. 2013a, King et al. 2013b, Michelsen et al. 2014, Schreuer et al. 2014). The following section summarises the benefits of using proxy report assessment, in addition to the relevance of different perspectives.

## 3.6 Perspectives to Include in Assessment of Children's Participation

The focus on person-centred practice has led to an increase in assessments that provide methods for gathering information from children themselves (Green and Wilson 2008). Within a paediatric context, 'the client' encompasses the family as well as the individual child, thus the term 'family-centred practice' is preferable to reflect the importance of working with the family (Kennedy et al. 2013). In addition, evidence-based practice recognises that gathering information directly from families is an important adjunct to research findings (Taylor 2007).

Existing research includes examples of using child-report information to investigate participation. Gathering child-report information is beneficial to understanding their subjective experience of participation. However, research indicates that children rate their performance differently to parents and therapists, often rating their behaviour and self-concept higher (Kennedy et al. 2012, Kennedy et al. 2013). These higher ratings may be reflective of children's perception of successful participation or lack of opportunities for comparison. In addition, not all children are able to engage fully with assessment, for example younger children and those with communication disorders. Although engaging children in assessment may have therapeutic potential,

it is also crucial to gather information from their parents for balance (McConachie et al. 2006, Kennedy et al. 2012).

Parent-report information is useful for building an understanding of children's participation within their own contexts and across various points in their lives. In addition, parents are able to contribute a greater wealth and depth of information about children's participation than healthcare professionals ordinarily have the opportunity to gather (Dunlap et al. 2001). Of particular value is the intimate insight that parents have into their child's life that is unmatched by therapists' perspectives (Lo et al. 2015). Parents are able to provide a longer-term impression of children's participation than therapists are and the influence of certain performance skills, environments or events in children's lives (Dunlap et al. 2001). Therapists' specialist expertise and experience are essential for effective therapy input (Rosenberg et al. 2013b). However, professional knowledge cannot replace parents' daily experience of their children's participation in all its complexity (Rosenberg et al. 2013b).

Parents use a variety of strategies to appraise their children's participation, including direct observation of the child and feedback from the child or others, such as teachers (Bedell et al. 2011). Therefore, parent-report information about children's participation is representative of their own insights and a synthesis of other sources of information, including children's perspectives (Bedell et al. 2011). Frederickson and Cline (2009 p. 132) emphasise that "the intimate knowledge that parents bring is enhanced by their emotional commitment to the child" allowing them to see aspects of their child's participation that no one else does.

Unlike child-report assessment, there is a predictive relationship between parent-report information and results produced by therapist-administered performance-based assessments (Kennedy et al. 2013). The information that parent-report generates is therefore a useful adjunct to therapist observations (Kennedy et al. 2012). In this sense, therapists and parents can make complementary contributions to the assessment process in that "…parent input can assist in illuminating children's daily life - what they do and how they do it, and therapist input can illuminate why a child participates as one does" (Rosenberg et al. 2013b p. 414). Thus, including parents'

intimate insight into children's participation supports development of rich, comprehensive assessment profiles.

In addition to having an intimate insight into their child's life, parents recognise the influence of the environment and acknowledge the impact of various interacting factors on their child's participation (Bedell et al. 2011). This recognition reflects theoretical underpinnings of ecological assessment and conceptualisation of participation (Bedell et al. 2011). Parent-report information is therefore valuable as having an intimate insight into understanding the complexity of factors that can influence children's participation (Stewart 2010). However, parent's closeness to their children can prevent them from being able to see all aspects of their situation (Frederickson and Cline 2009).

Various factors affect the ways in which a parent perceives their child's participation (Bedell et al. 2011). One of the challenges of parent proxy-report is the potential influence of their emotional involvement with their child, for example, parental anxiety may lead to them overemphasising difficulties (Chevignard et al. 2012, Treyvaud 2014). Such bias may affect the extent to which their information is an accurate reflection of children's participation (Treyvaud 2014). Although parent-report information is of significant value, it may therefore be beneficial to use teacher-report as an adjunct.

One of the key benefits of including parent-report information within assessment is the closeness with which they are able to view children's participation (Lo et al. 2015). However, Jacobs (2012) suggests that due to the length of time that they spend with children, it is possible to view teachers as 'the parent in school'. Teachers' daily interaction with children in school enables them to provide realistic observations of participation within the education context (McConachie et al. 2006, Jacobs 2012). There is a need to better understand and enhance children's participation at school (Coster et al. 2013a, Mâsse et al. 2013). Therefore, gathering information from teachers who have a beneficial insight into children's participation at school is important (Wallen et al. 2013).

Classroom sizes can affect the extent to which a teacher is able to provide in-depth information about children's participation (Shashi et al. 2013). However, the classroom environment also supports teacher's ability to compare groups of pupils and thus identify participation restrictions that may otherwise go unnoticed (Schott et al. 2014). Seeing children every day in multiple situations equips teacher to report children's performance skills or participation in a way that is not possible with the less contact available to therapists (Feinstein et al. 2009, UNICEF 2013). However, parents' particularly intimate insights into children's participation remains of significant value and thus a multi-informant approach may be of benefit (Faraone et al. 2005). There are few examples of existing research investigating children's participation that incorporate multiple perspectives and thus little information is available about the specific benefits of teachers' input.

Gathering information from multiple informants can provide a useful insight into different perspectives of children's participation and contribute to a comprehensive assessment profile. One of the potential challenges of using proxy-report information from multiple perspectives is lack of agreement between informants (Reed and Osborne 2013, Shashi et al. 2013). However, such disagreement is inevitable as each person's perspective has a variety of strengths and limitations, and their particular commitment to a child or professional background may lead to informant bias. Rather than treat these differences as conflicting, it is beneficial to seek to incorporate them in such a way that supports shared understandings (Shashi et al. 2013). Conflicting reports may reflect genuine differences in children's participation across contexts and thus provide useful insights into interactions between children and the different environments within which they participate.

Content, conceptual focus and proxy-report perspectives are important considerations when selecting assessments to use in clinical practice or research (Kielhofner and Forsyth 2007). However, it is also essential to ascertain an assessment's measurement qualities and evaluate whether its clinical utility is appropriate for the intended context. The following section overviews key issues relating to assessment clinical utility and measurement qualities.

Clinical utility refers to the usability of a particular assessment within practice and the extent to which it provides a means of effectively and efficiently gathering information (Law et al. 2005). Desirable clinical utility qualities include affordability, ease of use, procedural clarity and minimal respondent burden (Law and MacDermid 2014). Clinical utility therefore closely links to the influence of service context, such as resource constraints or service pathways (Kielhofner and Forsyth 2007, Kramer et al. 2009). In addition to service context, it is also important that assessments have good clinical utility to ensure that they do not have an adverse impact on children, for example by causing stress or fatigue as a result of complex or lengthy administrative procedures (Kramer et al. 2009).

The availability of high quality assessment is essential within the context of evidence-based practice (Kielhofner 2006b, Asher 2007). In addition to clinical utility, the measurement qualities also affect the suitability of an assessment. Gathering accurate information and, consequently, making appropriate judgements is possible when assessments have sound measurement qualities (Kielhofner 2006b, Kielhofner and Forsyth 2007). When linked with a clear conceptual basis, an assessment can be designed and procedures carried out to establish how well it measures that characteristic or construct (Kielhofner 2006b).

Reliability refers to the consistency of results with which an assessment measures individuals, often expressed as a correlation in terms of accuracy and stability (Kielhofner 2006b, Asher 2007, Brown 2012b). Ideally, any assessment results should be free from error and as far as possible resulting from true variance in the selected characteristic (Kielhofner 2006b). Different approaches to assessing and expressing reliability are available; which statistics are appropriate will depend on the administration form, measurement type and intended population (Jerosch-Herold 2005).

In addition to reliability, validity evidence provides information about the extent to which an assessment reflects the underlying construct that it purports to measure (Jerosch-Herold 2005, Asher 2007). Validity is an important aspect of demonstrating

the clinical relevance of an assessment and, as with reliability, is not a clear-cut result but a question of being suitably valid for purpose (Jerosch-Herold 2005, Brown 2012b). Measurement qualities are therefore a complex but important aspect of evaluating the suitability of individual assessments or methods.

Numerous factors determine which assessment is appropriate for a given situation. However, when considering the specifics of individual assessments and contexts it is important not to neglect the overarching priority of enhancing children's participation. Professional identity and theoretical underpinnings are particular influencing factors when selecting assessments.

## 3.8 Conclusion

Furthering knowledge about children's participation requires good quality assessment. Assessment is as complex as it is crucial and due vigilance can enhance the information that therapists and researchers are able to gather. Assessment supports evidence-based practice as, when following family-centred principles, it provides a means for incorporating the family's perspectives. Assessment also contributes to evidence-based practice when used within the data collection process by adding to practice knowledge. The variety of potential approaches and methods exacerbates the complexity of assessment and emphasises the need for careful clinical reasoning. Various factors influence the methods and assessments that therapists or researchers may select for use. Matching assessments to children and working within resource constraints are particular influencing factors.

Ecological assessment approaches are particularly beneficial within the context of supporting children's participation. Component-focused approaches can be useful in understanding how aspects of children's performance skills affect their participation. However, such information is most useful within the context of an understanding of children's everyday participation. Although therapist observation of children in context can provide in-depth information, this is often only across one or two time-points and thus limited in regards its comprehensiveness. Gathering ecological information about children's participation will therefore benefit from including the family and teachers within the assessment process.

Reflective of the focus on enhancing children's participation, there are growing numbers of assessments available for this purpose. However, although they share a common overarching aim, the structure, specific focus and measurement qualities differ between assessments. In order to determine the suitability and relevance of such assessments, it is helpful to complete a review of all those assessments that purport to measure children's participation. As such, the following chapter reviews the assessments currently available for measuring children's participation.

# Chapter 4 – Assessment Review

## 4.1 Introduction

Participation is a priority outcome for health professionals working with children with disabilities and it is important to ensure practice and research reflect this priority (Coster and Khetani 2008, Raghavendra 2013). Assessment is a foundational feature of healthcare practice (Brown 2012b). and has an important role within research, providing a structure for data collection (Kielhofner and Forsyth 2007, Hack and Gwyer 2013). It is therefore pertinent to draw attention to work in this area and identify assessments that lead to participation-focused intervention and research. Many of the assessments that have traditionally been available in paediatrics tend to focus on component parts of a child's underlying capacity or performance skills (Wilson 2005). However, sole use of such assessments can limit the quality of information and, thus, impact subsequent judgements (Darrah et al. 2011, Marshall and Lewis 2014).

In order to move away from such component-focused approaches, it is important that there are assessments that support family-centred, comprehensive and efficient measurement of children's participation (Darrah et al. 2011). Assessments designed for this purpose should provide a means of developing an overarching profile of children's participation within the context of their own life (Brown 2012a). Ideally, such assessments will incorporate a method for gathering information from multiple perspectives (Kennedy et al. 2012). Although a growing number of assessments exist for measuring children's participation, not all are equivalent in content or structure. Various factors affect the suitability of assessments, including contextual aspects such as practice settings or resource constraints (Kielhofner and Forsyth 2007). Any assessment used for clinical or research purposes, in addition to having theoretical relevance, should therefore demonstrate good clinical utility and psychometric qualities.

Reflecting the drive to understand children's participation, there is a growing number of available assessments designed to measure participation. Literature includes

several examples of articles that review assessments available for measuring children's participation (Phillips et al. 2013, Rainey et al. 2014). However, each of these reviews has their own particular focus, including children of specific ages, certain diagnostic groups or assessments that reflect a specific conceptualisation of participation (e.g. Ziviani et al. 2010, Phillips et al. 2013, Chien et al. 2014b). Which assessments feature in each review therefore varies and some are included in one article but not another. Although each of the existing reviews serve a purpose in their own right, the particular foci or inclusion and exclusion criteria limit the extent to which they are a full review of available assessments. In addition, given the increase in availability of participation assessments it is beneficial to monitor ongoing developments.

The purpose of this chapter is to provide a comprehensive overview of assessments that are available to measure children's participation. The decision was made to carry out a broad scoping review in order to gather initial information about as many assessments as possible. This information would allow for comparison of the assessments by highlighting differences and similarities between them to identify a smaller selection for more detailed critique.

## 4.2 Process

The search term "Participation AND review AND assess* or measur* or tool or questionnaire or scale AND child* or famil* or pediatric OR paediatric OR young person OR adolescent" was used for databases Cinahl, Medline and PsychInfo within EBSCOhost. The particular combination was chosen to reflect the interchangeable use of terms within research literature, while capturing only those studies relating to children's participation. The search, carried out in June 2015, returned 13 results, of which 6 were excluded as duplicates or those that are not review articles. The same search was repeated with ProQuest Central, however no additional results were found. Information about assessments was extracted from seven review articles (Morris et al. 2005, Sakzewski et al. 2007, Ziviani et al. 2010, Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a, Rainey et al. 2014).

A further search was carried out; omitting the term "review" to identify assessments not already included within existing review articles. Hand searching of reference lists,

assessment indexes and known available assessments was also carried out. The next step was to compile information from the individual articles to identify which assessments were included within each review. Initial information about assessments was extracted from the review articles and combined to provide a summary table (Appendix 1). From this basis, development and evaluation articles for specific assessments were identified and retrieved.

In total 28 assessments were included in the review articles. These include assessments that were referred to in multiple articles as well as others that had only one mention. A further six assessments not included in any review article were identified through database and hand searches, creating a total list of 34 assessments. In order to provide a comprehensive index, all assessments identified by the developers or review authors as useful for measuring children's participation were included. The abbreviation and full title of all of original assessments identified within the review articles and further searches are included in Table 4-1 for reference. However, only those assessments that featured in stand-alone development and evaluation articles or had available manuals were included within the descriptive overview below. Assessments not available in English were also excluded. This approach has been taken in order to provide a comprehensive overview of those assessments that are designed to gather information about children's participation.

In order to ensure a comprehensive review of all assessments, as far as possible information about numbers of items, scoring systems, format and respondent was extracted from the sources. In addition, information about which settings an assessment covers and the participation dimension was included. The expectation is that such information, in addition to psychometric analysis results, provides a beneficial comparison of assessments and their usefulness to practice and/or research. Appendix 1 includes a table of all of the above information as was available in review and psychometric articles.

**Table 4-1 - List of assessment abbreviations**

| Abbreviation | Full Title |
|---|---|
| APCP | Assessment of Preschool Children's Participation |
| APS | Assistance to Participate Scale |
| ASK-P | Activity Scale for Kids – Performance |
| CAMP | Caregiver Assessment of Movement Participation |
| CAPE/PAC | Children's Assessment of Participation and Enjoyment |
| CAQ | Community Activities Questionnaire |
| CASP | Child and Adolescent Scale of Participation |
| N/a | Child Engagement in Daily Life measure |
| CHORES | Children Helping Out: Responsibilities, Expectations and Supports |
| CLASS | Children's Leisure Assessment Scale |
| COSA | Child Occupational Self Assessment |
| CPQ | Children Participation Questionnaire |
| FOCUS | Focus on the Outcomes of Communication Under Six |
| FPQ | Frequency of Participation Questionnaire |
| ICF-FAS | ICF Functional Assessment Scale |
| LAQ-CP | Lifestyle Assessment Questionnaire - Cerebral Palsy |
| LAQ-G | Lifestyle Assessment Questionnaire – Generic |
| LIFE-H | Assessment of Life Habits for Children |
| LPS-C | The Life Participation Scale for Attention-Deficit/Hyperactivity Disorder (ADHD)-Child Version |
| M2P1 | Mayo-Portland Participation Index Rating Form)- subscale from Mayo-Portland Adaptability Index |
| N/A | National Survey of Schools and Environment |
| PACS | Paediatric Activity Sort Cards |
| PADL | Participation in Activities of Daily Living |
| PCPQ | Pediatric Community Participation Questionnaire |
| PEM-CY | Participation and Environment Measure - Children and Youth |
| PICO-Q | Participation in Childhood Occupations Questionnaire |
| PIP and ALIP | Pediatric Interest Profile and Adolescent Leisure Interest Profile |
| N/a | PIP Kid Play Profile |
| N/a | PIP Preteen Play Profile |
| PLA | Participation in Life Activities Scale |
| Preschool ACS | Preschool Activity Sort Cards |
| QYPP | Questionnaire of Young People's Participation |
| SCOPE | Short Child Occupational Profile |
| SFA | School Function Assessment |

Shaded entries indicate the 24 assessments included within the critical discussion

Of the 34 assessments, 10 had primarily been developed for data collection in a particular research study and, thus, there was limited available information. The remaining 24 assessments had stand-alone development or evaluation information available. The following sections include a comparative overview of these 24 assessments (section 4.3), followed by a further detailed discussion of nine of the assessments selected for their relevance to comprehensive measurement of children's participation (section 4.4). Appendix 1 includes information about the design and content of the 24 assessments included in the initial overview in section 4.3. Appendix 2 additionally includes psychometric information about the nine assessments identified for the detailed review in section 4.4.

## 4.3 Overview of Assessments

### 4.3.1 Target Groups

The included assessments, as detailed in appendix 1, are suitable for use with children of a range of ages and with a variety of diagnoses. Some of the assessments are suitable for use with age ranges as narrow as 2 or 3 years. In contrast, the assessment with the widest available age range is the SCOPE, which is appropriate for use with children or young people from birth to 21 years. Children under 3 years old and young adults 21 years old or over are each included a maximum of five times within assessment criteria. The smaller number of assessments covering these ages reflects typical ages of children receiving care from paediatric services. The most frequently included ages, each covered by at least 17 assessments, are those within the 6-12 years range. At least 10 assessments include adolescents from 13 to 18 years old, while a total of 6, 8 and 18 assessments included children of 3, 4 and 5 years old respectively.

Regarding diagnostic groups, there is less variability. Overall, 19 of the 34 assessments do not target children with a particular diagnosis or impairment. The applicability of assessments to a broad group of children aligns well with current interpretations of disability that focus on the impact that impairment may have on their day-to-day life rather than specific impairments (Read et al. 2012). However, there are instances in which therapists may find it beneficial to begin the assessment process by

considering the typical ways in which a certain diagnosis affects children's lives (Kielhofner and Forsyth 2007). Concurrently, the Child Engagement in Daily Life, LAQ-CP and the M2PI subscale are designed for use with children with acquired brain injury or cerebral palsy. In addition, the ASK-P and CAMP include children with physical disabilities or motor problems caused by neuromuscular disorders. Finally, the FOCUS, LPS-C and PLA are designed to measure children's participation as influenced by speech and language impairments, ADHD and asthma respectively.

### 4.3.2 Formats

Apart from COSA, LPS-C, PACS, SCOPE and SFA, all of the included assessments are in a questionnaire-type format. Of those not using a questionnaire format, the SCOPE and SFA assessments both include therapist observation while the LPS-C, PACS and COSA are completed in interview with a child or young person. Two of the three interview-based assessments include a 'card sort' format that provides pictorial representation of specific activities on individual cards. Four of the questionnaire-based assessments can also be completed in interview when therapists or researchers consider this the most appropriate approach.

The higher number of questionnaire-based assessments reflects growing recognition of the value of using self-report or proxy-report information when developing a child's assessment profile (Chevignard et al. 2012, Kennedy et al. 2012). One of the key benefits of using proxy-report assessments is the lower resource burden that comes from therapists not needing to carry out extensive interview or observation assessments. The use of self-report or proxy-report information is also thought to increase the extent to which the assessment profile is a true reflection of the individual's life (Kennedy et al. 2012).

Although the actual formats of the assessments are relatively similar throughout, the structure varies more noticeably. The number of items included within the assessments ranges from eight for APS to 266 for SFA. Most assessments have between 20 and 50 items within their total scale, with the mean number of items across all assessments being 43. Assessments also vary in whether they use subscales and sections specific to particular settings or participation types.

Of the included assessments, 13 gather information from the child's perspective and 16 include information from the parent or caregiver's perspective. An education or health professional can complete the SFA, while the SCOPE is a synthesis of a therapist's observations and their interactions with the child, education staff and family. The M2PI, CASP, SFA and QYPP are the only included assessments that offer options for gathering information from multiple perspectives.

Gathering comprehensive information about a child's participation requires including as many possible aspects of personal factors and environmental characteristics that influence their participation (Kielhofner and Forsyth 2007). Gathering information from multiple perspectives, including parents and teachers, can be particularly beneficial for children as a significant portion of their lives are spent at school (Jacobs 2012). Although the assessments identified in appendix 1 can gather information from a range of perspectives overall, the different formats, scaling methods and content reduces the possibility to use multiple assessments to synthesise information from respondents. In addition to considering the format and respondent of assessments, it is therefore also helpful to consider which situations of a child's life and the types of participation that they address.

### 4.3.3 Settings

Of the 24 assessments included within this review, nine gather information about children's participation at home, school and in the community. A further 13 assessments gather information about the child's participation at home and community or home and nursery. Four of the assessments measure participation related to only one of home, school or community. Finally, one of the assessments did not clearly identify which settings were included and another allows children to select activities and thus could refer to any or all of the settings.

As participation is a product of children's interaction with activities within the context of their environments, their participation across settings may differ (Palisano et al. 2012). Therefore, measuring children's participation in a single setting limits the comprehensiveness of information that a therapist is able to gather and thus may result in an incomplete assessment profile (Coster and Khetani 2008). Including

multiple settings within assessment supports comparison of children's participation across contexts and enriches understanding of children's participation strengths and challenges (Kennedy et al. 2012, King 2013). Such assessments may therefore be particularly relevant for use in paediatric practice and research.

Therefore, the following sections include a comparative critique of the nine assessments gathering information about children's participation at home, school and in the community. The detailed review includes the following nine assessments: CASP, COSA, CPQ, LIFE-H, PACS, PEM-CY, PICO-Q, QYPP and SCOPE. Apart from the COSA, each of the assessments was included within at least one assessment review article. The focus is on the suitability of the assessments for gathering comprehensive information about children's participation. Appendix 2 includes additional information about each assessment relating to their psychometric qualities.

## 4.4 Detailed Review of Assessments of Children's Participation Across Home, School and Community Settings

The following detailed review focuses only on those assessments that include consideration of children's participation at home, school and in the community. The expectation is that such assessments offer richer information about children's participation, whether for the purposes of clinical practice or further research. In addition to the above information about format and target groups, the following section includes consideration of the structure, dimension and content of the individual assessments, as summarised and highlighted in appendix 1. This section also includes information about available psychometric evidence for each of the assessments and consideration of their suitability. Appendix 2 includes measurement qualities for each of the assessments in this detailed review as reported in available analysis articles. In addition to the articles, manuals or other associated materials were retrieved from publisher's websites or the author's library, where available.

### 4.4.1 Format, Respondent, Age Range

Each of the nine assessments relate to children's participation in home, school and community settings. Consequently, they include consideration of children's participation in a range of everyday activities; including self-care, play, academic activities and community living. The assessment respondent is either parent or child for six of the assessments, with two of the nine assessments (CASP, QYPP) providing options for both parent and youth report. The Short Child Occupational Profile (SCOPE) is unique in that the therapist completes the assessment using information that they gather from observation, records, and discussion with the child and others. The SCOPE is the only assessment to incorporate an education perspective, which it does through interview.

Inclusion of parent-report in six of the nine assessments aligns well with family-centred practice (Rosenberg et al. 2013b). However, poor representation of the teacher's perspective in all but one of the assessments is surprising given that they all address aspects of children's school participation. Although teachers are not as intimately involved with children as their parents, the classroom setting and teacher training provide them with a useful insight into children's participation in comparison to their peers (Jacobs 2012). Exclusion of teacher-report may therefore limit the comprehensiveness and richness of information that therapists can gather about children's participation at school using the included assessments.

All of the assessments are designed for use with children with a variety of disabilities or impairments. However, the target age ranges vary. Assessments with as narrow an age range as CPQ (4-6 years) allow for a greater specificity of age-appropriate items. However, the wider age range of assessments such as CASP or SCOPE reduces the need to use multiple assessments for children of different ages within their practice. Careful consideration in clinical and research settings is required to identify whether age-specific items or a one-size fits all approach is more practical and relevant. As participation refers to children's engagement in life situations rather than successful performance of specific activities it may be that age-specificity is less necessary when measuring participation than for criterion or norm-referenced assessments.

Six of the nine assessments included in the review have between 20 and 45 items. The PEM-CY, PACS and LIFE-H are the three longest assessments; with 53, 75 and 64 or 197 items respectively. As with age ranges, there are various issues to consider when evaluating an assessment's content and the number of items in itself is not sufficient to understand the comparative comprehensiveness or utility. For example, although the QYPP has 45 items, five of these are related to education, which is the same quantity as the much shorter CASP, and less education items than the PICO-Q. However, the relatively short education content may also reflect the older age group that the QYPP targets. Although the PEM-CY is longer than a majority of the assessments, the questionnaire is divided such that 20 items address children's participation while 33 relate to their environment. Further, respondents are asked multiple questions in relation to each item.

Although one of the assessments with the fewest items, the PICO-Q asks the parent or caregiver to rate their child's participation on three dimensions. Thus, each questionnaire includes 66 data points. Including multiple dimensions for each item may be less of an issue for shorter questionnaires such as the PICO-Q than for longer assessments such as the CPQ (220 total data points) or PEM-CY (up to 179 data points). In contrast, the CASP, QYPP and SCOPE use a single rating scale for each item. Similarly, the PACS uses a binary option to ascertain whether a child participates in a given activity and a scale to rate frequency for each relevant activity.

Measuring multiple dimensions of participation may help develop a richer assessment profile (Kang et al. 2014). In addition, gathering such breadth of information may support understanding the complexity of participation. Within research, there are several attempts to measure the effects of child characteristics or environmental features on aspects of children's participation. However, the burden on respondents increases with higher numbers of items or questions and may hinder them from completing a full questionnaire or give less attention to the questions that they answer latterly (Kramer et al. 2009). Similarly, Missiuna et al. (2016) report that using the PEM-CY to capture multiple aspects within research was problematic as the

additional concepts caused confusion for parents. More items therefore do not necessarily guarantee higher quality of information.

All of the assessments included within the detailed review use rating scales to quantify children's participation. The PACS and CPQ also include a binary response and the CASP a 'not applicable' option that remove the need to provide a rating for activities that are not relevant to a child's life. As noted, some of the assessments use multiple scales and these also vary in length, for example the LIFE-H uses a 5-point and 7-point scale. Having a higher number of response categories increases the possibility of variability, a desirable quality within measurement (DeVellis 2012). However, it is also possible to achieve variability with higher numbers of items that have fewer response options (DeVellis 2012).

In order to explore the content differences between assessments further, the following section overviews participation dimensions of the assessments.

### 4.4.3 Measurement Dimensions

In connection with debates about conceptualisation, discussion surrounds the relevance of measuring particular dimensions of participation such as frequency, level of involvement or diversity (Kielhofner and Forsyth 2007, Pereira et al. 2010, Granlund 2013). The number of dimensions of participation that the included assessments measure varies from one to five. The most often used dimension across all of the assessments is 'frequency' or extent, utilised in five of the nine assessments. Similar to frequency, the CASP measures the perceived level of a child or young person's participation in comparison with peers and the PICO-Q levels of performance of participation-based activities. This approach to measurement reflects literature about conceptualisation that suggests that frequency, extent or level of participation are appropriate indices of participation (Granlund 2013).

Also similar to 'frequency', the CPQ includes a 'diversity' scale that provides a summary score of the number of activities in which a child participates. Such a measurement can provide useful insights into whether children with certain characteristics participate in different amounts of activities. However, it is useful to

consider this information in association with knowledge about the family's context and preferences, i.e. what a child's environment expects of them (Palisano et al. 2012).

The PEM-CY includes an 'involvement' rating scale to measure the extent of a child's involvement in an activity. Considering involvement when conceptualising participation reflects the different levels of participation in activities that children might experience, for example active or passive (Pereira et al. 2010). However, as with diversity it is important to consider this within the context of a child's own life, an aspect that is supported by the 'desire for change' rating scale within the PEM-CY.

The CPQ and PICO-Q are parent-report assessments that include questions about children's enjoyment of participation in a particular activity. Answers to such questions can provide information about children's volition for participation. Having information about a child's enjoyment is relevant to understandings about subjective aspects of participation (Cole 2010); however, inclusion of a subjective aspect within an objective proxy-report may have limited accuracy. In addition, there is debate surrounding the relevance of addressing factors such as enjoyment within measures of participation as this may relate more directly to quality of life, a primarily subjective concept (Colver 2009).

In addition to items relating to level or frequency of participation, three of the assessments include rating scales for the parent to report their satisfaction with (CPQ and LIFE-H) or desire for change for (PEM-CY) their child's participation on each item or activity. Knowing that a parent is dissatisfied with certain aspects of their child's participation or desires change within a particular area may guide the therapist's clinical reasoning in knowing what to prioritise within intervention. Considering areas of importance to the family is relevant to family-centred practice and supports goal-setting discussions that the therapist can then use to guide intervention (Coster and Khetani 2008, Palisano et al. 2012).

A further dimension that two of the assessments (LIFE-H and CPQ) include is assistance. Gathering information about the assistance that children require can be beneficial in identifying services and resources that they need to support their

participation (Kielhofner and Forsyth 2007). Neither the LIFE-H nor CPQ contain items that explicitly refer to environment. However, the environment is included as a feature of other assessments that do not include rating scales about assistance.

The SCOPE and PEM-CY include sections that address aspects of children's environments. The CASP includes general open questions asking for identification of environmental factors that support or restrict children's participation. Consideration of the environment is important when measuring children's participation as it can have a significant impact on how they are able to participate in a particular setting (Coster 1998). Inclusion of information about children's participation at home, school and community does allow for some comparison across environments (Coster 1998). However, as participation arises from an interaction between children, their activities and the environment, including information about the environment may support an in-depth understanding of a child's particular strengths or challenges (Missiuna et al. 2006, Stewart 2010).

Two assessments that do not include any of the measurement dimensions already mentioned are the SCOPE and the COSA. Both of these assessments were based on the Model of Human Occupation (MOHO) and thus the language used differs from others in the review (Keller 2005, Bowyer 2008). The SCOPE is a rating based assessment that therapists complete following review of documentation and interviews with parents, teachers and children. Unlike other assessments that measure children's participation in particular activities or situations, the SCOPE focuses on aspects of a child's personal factors and environment and rates these according to whether they facilitate, allow, inhibit or restrict occupational performance. Although the language used is different, Ziviani (2010) highlighted SCOPE as a potentially useful assessment for understanding children's participation.

The COSA is a child-report assessment that asks children aged 8-13 years old to rate their competence in 25 activities and indicate associated value. The COSA provides therapists with a means to gather information about children's own perception of their strengths and challenges. The COSA does refer to general activities rather than component parts and in this sense aligns well with current understandings of participation (Lane 2012, Law et al. 2013). However, although it can be helpful to

include children's perspectives within assessment, it is important to gather information from parents and teachers as significant others in children's lives (Chevignard et al. 2012, Kennedy et al. 2012). Therefore, it is not sufficient to use the COSA as the only assessment to gather information about children's participation.

The assessments included within the detailed review adopt different strategies for measuring participation, with variation between the format, respondent, numbers of items and scoring structure. Although less evident in the scoping review, there is also variation between the particular aspects of participation that the assessments are used to measure. For example, assessments such as the CASP, PEM-CY and QYPP categorise the items according to the participation setting in which they typically occur (i.e. home, school, community). Assessments such as the LIFE-H and PICO-Q use categories based on the type of an activity (i.e. daily care, play). Children's participation is contextual and it is helpful to situate activities within the particular context that they occur (Palisano et al. 2012). However, it may be that the same information is ultimately gathered with an activity categorisation approach and thus this may be less of an issue than other differences between assessments.

#### 4.4.4 Summary of Assessment Format, Structure and Content

Nine assessments relating to children's participation at home, school and community were identified for review within this section. However, although similar in their purpose, the assessments differ in their format, administration and structure. The conceptualisation and measurement of participation is complex and thus it is not surprising that there is such variability in assessments designed to measure children's participation (Phillips et al. 2013, Raghavendra 2013). There are challenges reported in regards to identifying a 'gold-standard' assessment of complex concepts such as participation (Asher 2007). It is appropriate, therefore, to acknowledge strengths as well as limitations of the various assessments included within this review.

Assessments such as the CASP, COSA, PICO-Q and QYPP are useful for their relative brevity and, thus, reduced respondent burden. Conversely, more extensive assessments such as the CPQ, LIFE-H, PACS and PEM-CY are designed to provide a greater extent of detail about children's participation. Meanwhile, the SCOPE uses a

brief scale to summarise a wealth of information collected through observation and interview. However, the depth of information produced by the SCOPE needs to be balanced with the potential resource burden associated with the time required to carry out observation and multiple interviews.

As they gather information from children or parents, the assessments all reflect components of family-centred practice and collaborative working (Wilson 2005, Adams 2007). In addition, capturing information from children can give some insight into their volition. However, of the nine assessments included in the detailed review, only the SCOPE includes processes for gathering information from teachers and this only by interview. The National Survey of School and Environment uses a teacher-report questionnaire, however only addresses school participation and was designed for a research study, not available for wider use, thus not included in the review. Including information from teachers is important not only to gain detailed insights into children's participation at school but also to have a second perspective from which to gain further understandings about a child's life situation, thus enhancing the richness of the assessment information (Jacobs 2012, Rosenberg et al. 2013b).

Covering all three settings of home, school and community, the assessments typically address multiple aspects of children's participation. However, only the SCOPE and PEM-CY clearly draw attention to a child's environment and ways in which it might support or restrict participation. This is a weakness of the included assessments in the context of a move towards ecological assessment practice that reflects the contextual nature of participation. In addition, the assessments provide little scope for capturing information about contributory factors such as performance skills or self-concept.

All of the assessments therefore provide methods to gather information about children's participation at home, school and in the community. Each of the assessments have particular strengths, whether clinical utility or comprehensiveness of information. However, two gaps found with a majority of the included assessments is poor attention to children's environment and limited opportunity to ascertain the teacher's perspective within the assessment profile. Therapists or researchers selecting these assessments for use in practice may therefore need to adopt additional

strategies to supplement this information. It is not sufficient only to qualitatively evaluate the structure and content of an assessment for suitability. Therefore, the following section overviews psychometric evidence, where available, of the included assessments.

### 4.4.5 Measurement Qualities

Various aspects affect the suitability and appropriateness of assessments designed for use in practice and research (Kramer et al. 2009). In addition to ensuring theoretical relevance and clinical utility, it is important to evaluate an assessment's measurement qualities (Kielhofner and Forsyth 2007, MacDermid et al. 2014). Assessment psychometric studies are one of the most common types of research examining therapy processes or outcomes, which ensure the dependability of assessments that therapists use in practice (Kielhofner 2006b). In this sense, assessment evaluation is an important aspect of enhancing evidence-based practice.

Measurement theory has a long background, founded in the physical sciences, that emphasises the importance of using quality assessments to generate valid and reliable scores (Jerosch-Herold 2005, DeVellis 2012). Unlike physical science measurement, health attributes such as participation are not readily concatenated physically as is in a ruler or thermometer (Bond and Fox 2015). However, measuring health phenomena such as participation has no fewer requirements for validity and reliability than does the physical sciences (Andrich 1988). The following section overviews information about the measurement qualities of the included assessments. Information about the relevant evaluation studies is also available in appendix 2.

One of the evidences typically referred to within development and analysis studies is content validity (Jerosch-Herold 2005). Content validity is established through input and review from other academics and professionals or the intended assessment population (Streiner 2008, Richardson 2015). This process ensures that the content of an assessment is based on more than the developer's opinion and provides opportunity for integrating perspectives from those who are likely to use the assessment (Jerosch-Herold 2005, Asher 2007). All of the assessments within the current review report processes undertaken to establish content validity. Appendix 2

includes details of the measurement qualities available in existing research for each of the 9 assessments.

Several of the assessments, including the CASP, COSA, CPQ, LIFE-H, QYPP and SCOPE, have been based on existing assessments or models already used within practice and research. In addition, all of the assessments have reports of development or review undertaken with input from academics, practitioners and families. The QYPP evaluation study additionally includes Content Validity Index (CVI) percentage scores, a statistical representation of expert agreement that items on an assessment are relevant to the construct or population under measurement (DeVellis 2012). The CVI scores for QYPP further support its content validity.

Of the included assessments, evaluation studies about CASP, CPQ and LIFE-H use convergent validity approaches to explore the association between the assessment under investigation and other assessments. The results of these investigations at least partially support construct validity for each of the three assessments. As the measures used for comparison differ in their purpose and conceptual basis to those under examination it is not expected that there would be significant strong correlations.

Further analyses of validity concern construct validity (Asher 2007). The approaches used to assess construct validity can vary, however calculating correlations between assessments are common in the included studies. Such an approach involves analysing how well an assessment predicts a child's performance on another measure (Richardson 2015). Interpretation of results will vary according to the purpose of the assessment and the comparisons being made, however there is a suggestion that when an assessment is not used for 'high stakes' medical or research decisions, the need for high correlation statistics is lower (Kielhofner 2006b). The availability of gold standard assessments with which to compare others is also limited (Asher 2007).

Another method for analysing construct validity is to test the assessment against conceptually relevant hypotheses (Jerosch-Herold 2005, DeVellis 2012). For example, within measurement of participation it is expected that participation levels will vary across different types or severity of disability. Results for the CASP and PICO-Q

report differentiation between children with different types of disability, indicating conceptually relevant measurements of participation. Similarly, the LIFE-H results indicate significant main effect difference between children with and without disabilities on all measures. CPQ and PEM-CY evaluation studies both use two-way ANOVA to investigate group effects.

The CPQ detected less participation and independence for young children, as would be expected, however no main effects for intensity, enjoyment or satisfaction. Similarly, the PEM-CY study found a significant disability effect across all settings and variables, in addition to significant age group effect for involvement at home and school. Both assessments therefore measure children's participation in a way that reflects existing research.

Internal consistency is a measure of assessment homogeneity, used to demonstrate the equivalence of items within classical test theory (DeVellis 2012). Internal consistency is typically expressed as either intraclass correlation (ICC) or Cronbach's alpha, depending on the assessment (DeVellis 2012). Of the assessments for which these results are reported, all demonstrate moderate to good internal consistency. Complex, multi-faceted constructs are not expected to have perfect internal consistency and thus lower scores are expected (Asher 2007, DeVellis 2012). Participation is a particularly complex construct and thus one for which internal consistency is challenging to achieve. In addition to internal consistency, some of the included assessments have reported inter-rater and/or intra-rater reliability results. Reliability of this kind indicates confidence that results from the assessment will be the same when measured by different raters or on different occasions (Kielhofner 2006b). Again, all of the assessments expressing inter or intra rater reliability demonstrate moderate to high correlations, of which CASP and QYPP demonstrate particularly high ICCs.

Two of the assessments, COSA and SCOPE, were evaluated using Rasch analysis. Rasch analysis calculates item difficulty and person ability scores on an equivalent scale, providing the opportunity to assess targeting and dimensionality of the assessment (Bond and Fox 2015). Measures are assessed for fit to the Rasch model, demonstrating that items appropriately measure persons on a single construct (Bond

and Fox 2015). Both the COSA and SCOPE had 24 out of 25 items fitting the Rasch model. Further examination indicated that the misfitting items were conceptually relevant and that the items grouped closely at the 'top' of the difficulty level represented different MOHO concepts, validating the construct relevance of the assessments. Rasch analysis also expressed the suitability of the rating scale categories for both assessments. As a majority of COSA and SCOPE items meet the assumptions of Rasch modelling as well as having content validity, there is evidence that the assessments measure a single latent trait.

#### 4.4.5.1 Summary of Assessment Psychometrics

The complexity of participation and the different types of assessment create challenges when interpreting psychometric statistics. However, the assessments included within this review exhibit acceptable psychometric qualities. Each of the assessment developers and researchers report steps taken to ensure the content validity of the assessment. For some assessments, content validity is found in the conceptual basis, while for others expert review and input has been the primary mode of checking.

The assessment with the weakest psychometrics is the PACS; however, this is perhaps due to a significant portion of the research being carried out as masters or doctoral projects and thus published as 'grey' literature. For those assessments demonstrating lower psychometric statistics than typically considered ideal, the developers explore this in terms of conceptual relevance. Additionally, it is generally accepted that assessment development is an iterative process and so reference to plans for future work is made within a majority of the studies.

## 4.5 Conclusion

Enhancing children's participation has become a priority area within paediatric healthcare practice and research (Granlund 2013, King 2013). Assessment practice is therefore evolving to reflect this, in order to lead into participation focused intervention strategies (MacDermid et al. 2014). The interaction between evidence-based practice and assessment is two-fold. Research evidence can demonstrate the

effectiveness of assessments that therapists use in practice, thus providing an evidence base for the use of a particular assessment (Kielhofner 2006b, Taylor 2007). In addition, the availability of good quality, ecological assessments can support data collection in research investigating children's participation.

Inclusion of the client perspective is an essential aspect of evidence-based practice that is supported by the use of clinically useful assessments (Taylor 2007). The preceding review identified a selection of assessments designed to measure children's participation. Of the 34 included assessments, nine were identified as measuring children's participation at home, school and in the community. These nine assessments therefore became the focus of a more detailed review of content and psychometric qualities.

Measurement of children's participation in a variety of contexts is important for developing a comprehensive participation profile and all of the assessments within the review do this to some extent. Each of the assessments included within this review exhibit further strengths depending on the context and purpose of use. The strengths of some assessments are found in their brevity or their accessibility in terms of the wide age range. For other assessments, their strength is in the detail and/or breadth of information about children's participation that they are able to gather.

Apart from the SCOPE, the assessments in the detailed review are all child or parent-report questionnaires. Completion of the SCOPE includes gathering information from teachers through interview (Bowyer et al. 2012); however, such an approach does not have the resource-reducing benefits of proxy-report questionnaires. Inclusion of teacher-report assessment is a valuable adjunct to parent-report information, particularly for comparing children's participation across settings (Faraone et al. 2005, Wallen et al. 2013); however, this is poorly reflected in the reviewed assessments.

In addition, integration of information about a child's environment provides useful insight into factors that support or restrict their participation in the various settings in which they engage. Capturing information about children's participation across multiple settings may give insights into environmental effect. However, there is

limited consideration of specific features of the environment and the effect that it may have on their participation within the included assessments. Therefore, although the assessments all adopt a similar purpose and exhibit strengths in assessing children's participation in home, school and community, there are also weaknesses. In addition, there is little consideration of other contributory factors associated with children's participation.

The lack of assessments that incorporate parent and teacher report information partially explains the lack of research investigating these two perspectives of participation. If, as literature suggests, the integration of multiple perspectives enhances the quality of information, it is imperative that more assessments are available for this purpose. An assessment currently only available in research version and not yet evaluated, thus not included within this review, is the ACHIEVE Assessment.

As a method for gathering information about children's participation and contributory factors across multiple settings reported by parents and teachers, the ACHIEVE Assessment is conceptually relevant to current research and practice. However, it is not enough for an assessment to be paradigmatically relevant. If an assessment is to be useful for gathering quality information within practice and research it requires suitable measurement qualities (Jerosch-Herold 2005, Kielhofner 2006b, DeVellis 2012). There are various aspects of analysing measurement qualities and the process will depend on the purpose, structure and intended context of the assessment (DeVellis 2012).

The ACHIEVE Assessment is a potentially useful resource for overcoming challenges mentioned in the preceding review by incorporating equivalent reports from parents and teachers, in addition to including a section specifically addressing environmental factors. The following chapters outline a research study to evaluate the ACHIEVE Assessment measurement qualities.

# Chapter 5 - Methods

## 5.1 Introduction

Current conceptualisations of disability have led to the promotion of participation as a priority concept within healthcare (Soref et al. 2012, Granlund 2013, Imms et al. 2016). Participation, defined as contextualised involvement in life situations, is necessary for children's health, well-being and development (Hoogsteen and Woodgate 2010, Ziviani et al. 2010, Law et al. 2013). Healthcare research reflects this recognition of the importance of participation, with a drive to enhance understandings of supportive or restrictive factors of children's participation (Phillips et al. 2013, Raghavendra 2013, Rainey et al. 2014, Imms et al. 2016).

As a means to gathering information about and measuring children's participation, assessment is a central feature of healthcare practice and research (Brown 2012b, Phillips et al. 2013, Rainey et al. 2014). Within practice, assessment serves the purpose of informing therapists' judgements and clinical decisions about specific children, or for service audit and evaluation (Brown 2012b). In addition, researchers use assessment to gather information about individuals or groups, in order to understand the implications of a particular characteristic, environmental feature or intervention better (Phillips et al. 2013). Assessment is therefore a priority area for ongoing development (Brown 2012b).

As understanding and optimising children's participation is a priority area for healthcare, it is unsurprising that there are growing numbers of assessments available to measure children's participation (Ziviani et al. 2010, Phillips et al. 2013, Chien et al. 2014a, Rainey et al. 2014). Although several assessments currently available to measure children's participation do so with consideration of multiple contexts, few include the teacher's perspective. Including teacher-report information ensures accurate and comprehensive assessment of children's participation across all of their life settings.

Having explored conceptualisations of participation and the benefits of assessment evaluation, it is therefore pertinent to carry out work to analyse the measurement qualities of the ACHIEVE Assessment. The rationale for this piece of work relates to three key aspects; participation as a necessary and valuable right for all children, assessment as a useful method to better understanding and optimising children's participation; and the importance of using quality assessments that reflect true measurement principles.

One of the challenges of evaluating the measurement qualities of an assessment is that classical approaches require an assumption that data is interval level when this is ordinarily not the case (Bond and Fox 2015). Contemporary Item Response Theory approaches, including Rasch analysis, have therefore increased in popularity as they first convert ordinal level data to an interval scale that researchers can then assess for fit to the measurement model (Kersten and Kayes 2011, Boone et al. 2014, Bond and Fox 2015).

Rasch analysis was therefore selected for analysis of the ACHIEVE Assessment. Recruitment for the study was carried out in health boards across Scotland with parents of children invited to participate by giving consent to use of their child's assessment within the study. All data was collected anonymously, without the researcher requiring contact with children or their parents, and input into SPSS (IBM Corp. 2012) and Winsteps (Linacre 2016a) for analysis. The researcher then examined the data for fit to the Rasch measurement model using a range of criteria and in consideration of relevant theory as discussed in the first four chapters of this thesis.

This chapter includes a rationale for the work carried out, including an overview of relevant measurement theory (section 5.4), a rationale for the chosen approach (sections 5.5 and 5.6) in addition to an outline of the programme of work and data analysis procedures (sections 5.7 and 5.8). For clarity within this chapter, 'assessment' refers to the full collection of items included within the ACHIEVE Assessment and 'measure' refers to the child and item calibrations produced by Rasch modelling. Finally, 'scale' refers to the use of ordered categories to rate an attribute.

## 5.2 Research Questions

The primary research questions for the current study are therefore:

- Is the ACHIEVE Assessment a quality, unidimensional measure of children's participation as demonstrated through Rasch modelling?
- How does the hierarchical structure of the ACHIEVE Assessment items contribute to understandings of children's participation?
- To what extent can information from parents and teachers be usefully combined or compared to further understandings of the complexity of children's participation?

## 5.3 Conceptual Basis

Practice and research knowledge benefits from framing within conceptual models. The use of such models provides conceptual bases for both and, often, practical guidance in how the theories should be implemented. The Model of Human Occupation (MOHO) is one conceptual model, most typically used within occupational therapy (Kielhofner 2007a). MOHO provides conceptualisations of participation and guidance regarding assessment.

Of particular interest to this study, MOHO recognises that an individual's engagement in daily life is influenced by a complex interaction of factors including their own characteristics, skill sets and the environment (Kielhofner 2007b). Recognition of the interaction of factors influencing children's participation is reflected in the ACHIEVE Assessment. Each section on the ACHIEVE Assessment corresponds to the MOHO concepts of habituation, volition and performance skills (motor skills, social interaction skills and process skills, named in the ACHIEVE Assessment as physical skills, social skills and organisation). MOHO therefore reflects current conceptualisations of disability that recognise it results not from impairment or the environment alone, but an interaction of the individual's personal factors with environmental characteristics (Kielhofner 2007a).

There is a long-standing tradition of using measurement to gather and quantify information about various aspects of the human condition within healthcare research and practice (McDowell 2006, DeVellis 2012). Without good quality measurement, clinicians and researchers are at risk of introducing flaws into their data collection methods and, thus, draw incorrect conclusions about the population or construct of interest (Kielhofner 2006b, McAllister 2008). Therefore, the availability of good quality assessments is crucial. There is a range of quality indicators and evaluative approaches available to ensure effective measurement.

Rating scales are often useful when it is not possible to measure a particular behaviour or phenomenon directly (DeVellis 2012). All children have a complex array of characteristics; however, it is typical to focus on a single attribute within assessment (Andrich 1988). The construct of interest is referred to as the 'latent variable' which forms the focus of measurement and which assessment developers attempt to map on a 'single real number line' (DeVellis 2012, Streiner et al. 2015). In this sense, the aim is to align current healthcare assessment with the standards expected of measures such as height, weight or temperature (Bond and Fox 2015).

Some health indicators or concepts that researchers previously thought too complex to be measurable are becoming the focus of new assessments (Streiner et al. 2015). Many concepts of interest within healthcare are complex and multifactorial, however for the purposes of measurement, and where possible, it remains useful to consider constructs as unidimensional (Andrich 1988). Participation is widely stated to be a complex construct. However, the importance of the construct has led to extensive development of new assessments to provide a means of assessing children's participation. Further, the process of defining a construct and developing a relevant assessment is iterative and a process that often results in further theory refinement (Andrich 1988, DeVellis 2012). Therefore, attempts to measure participation and develop appropriate assessments are valuable for furthering understandings in the area of enhancing children's participation.

An essential feature of good quality assessment is that differences detected in measurement reflect reality and are due to true differences, not errors within the data (Streiner 2008, DeVellis 2012). In addition, it is important that when measurements are repeated in different samples of children, the function of the assessment does not differ (Bond and Fox 2015). Validity and reliability are therefore widely accepted as key indicators of measurement quality (Kielhofner 2006b, DeVellis 2012). Validity refers to an assessment measuring what it is supposed to and reliability to the extent to which it measures that construct well (DeVellis 2012).

Discussions relating to appropriate approaches to analysis of assessment qualities typically centre on classification of nominal, ordinal, interval and ratio measurement levels, known as Stevens' levels of measurement (Andrich 1988, Streiner et al. 2015). The levels of measurement operate on a hierarchy in which each is valuable, however the particular usefulness and applicability depends on the context in which they are being utilised (Wright and Linacre 1989). Issues arise when data at one measurement level is treated using statistics better suited to another level (Wright and Linacre 1989).

Assessments used to measure children's participation often incorporate rating scales. Assessment developers may allocate numeric values to categories on a scale, however doing so does not equate to being additive measurement; ordinal measurement purely gives an indication of rank (McAllister 2008, Slevin 2010, Bond and Fox 2015). The distinguishing characteristic of interval level measurement is the equal distance between each step on the rating scale (Kielhofner 2006b). Only interval level assessments have additive qualities and are suitable for parametric statistics treatment (Bowling 2005).

## 5.5 Research Methodology Rationale

Disability and healthcare research includes a wide variety of approaches, methods and techniques used to generate new information and build upon existing knowledge (Allsop 2013). Research is most typically categorised into one of two overarching methodologies; qualitative or quantitative, influenced by interpretivist and positivist paradigms respectively (Allsop 2013). Qualitative and quantitative research both

focus on the generation of new knowledge, however the approaches that they take to do so differ (Slevin 2010, Allsop 2013). Qualitative methodologies typically use words-based data to gain insights into lived experience and associated meanings attributed to particular health conditions, circumstances or interventions (Priest and Roberts 2010, Slevin 2010). In contrast, quantitative research is used to generate empirical knowledge of phenomena by explaining 'what' is happening and 'why' (Allsop 2013). Quantitative research typically includes the application of numbers and statistics to quantify attributes (Clark-Carter 2010, Slevin 2010).

Ross (2012 p. 34) argues that debate relating to the legitimacy of knowledge acquired by either methodology is often futile as both have "purpose and place according to the research question." Rather than debate which methodology is 'best' in and of itself, researchers should instead consider which better serves the focus of their research question (Carpenter and Hammell 2000, Silverman 2011). The focus of the present research is evaluation of the ACHIEVE Assessment which shapes the appropriate methodology, as explored below.

Benson and Clark (1982) suggest a four-phase process for assessment development and validation. The first two phases involve establishing the purpose of an assessment by carrying out preliminary development work with the intended population and having relevant 'judges' qualitatively evaluate the initial version (Benson and Clark 1982). Following completion of the initial phases, focus then turns to quantitatively evaluating the assessment's measurement qualities (Benson and Clark 1982). The ACHIEVE Assessment is a pre-existing assessment that was developed on the basis of extensive literature review and following qualitative research with parents, teachers and therapists. The first two, primarily qualitative phases of the above process are therefore complete for the current iteration. Thus, it is appropriate to follow a quantitative methodology for the current work in order to establish the measurement qualities of the ACHIEVE Assessment.

Typically, evaluation of an assessment's measurement qualities involves application with the intended population, then collecting the generated data for analysis (Jerosch-Herold 2005). Classical test theory and item response theory are frequently used approaches to analysing data generated for psychometric studies (Streiner et al.

2015). However, item response theory is increasingly gaining favour due to its underlying premises and analytic approach (McAllister 2008, Bond and Fox 2015). The following section overviews both approaches and the rationale for adopting an item response theory approach, Rasch analysis, within the current study.

## 5.6 Rationale for Methods

There is recognition of the value of raising the current standard of healthcare assessments (Bowling 2005, Bond and Fox 2015). In particular, there is a drive to ensure that assessments generate true measures of child characteristics as relevant to health and disability (Bond and Fox 2015). Multiple methods exist for evaluating assessments and which is most appropriate depends on the structure of each assessment and the purpose for which it is designed. However, two of the most common approaches are classical test theory and item response theory (Kielhofner 2006b, McAllister 2008, DeVellis 2012, Bond and Fox 2015). Both approaches exist with a similar aim to develop and evaluate quality assessments. However, the underlying theory and processes each uses to achieve this aim are fundamentally different (McAllister 2008).

Classical test theory (CTT) has traditionally been the more popular approach to evaluating assessments in healthcare and many have used this approach in developing assessments commonly in use today (McAllister 2008, Streiner et al. 2015). CTT approaches use the raw score data generated to evaluate the measurement qualities by examining relationships between the scores (McAllister 2008, DeVellis 2012, Streiner et al. 2015). This approach requires that the numbers allocated to an observed behaviour have additive qualities that allow generation of a total score (Bond and Fox 2015). However, only interval level scales generate truly quantitative data that can be added on a 'single true number line' and health assessments typically generate ordinal data (McAllister 2008, Bond and Fox 2015). Therefore, researchers are increasingly turning to item response theory that first begins with using log odds equations to convert ordinal responses to log odds probability units (logit) to create an interval scale suitable for further analysis (McDowell 2006, Bond and Fox 2015).

Item response theory (IRT) recognises that, as is the case for markings on a ruler, individual items within an assessment can capture varying amounts of a single construct (McDowell 2006). Scores on an assessment reflect the difficulty of items and ability of children, with an expectation that a single assessment will cover a range of difficulties and accurately represent a child's ability (McDowell 2006). In so doing, IRT allows the development and evaluation of true measurement of a single construct (Velozo et al. 2006). In reality, IRT encompasses a selection of approaches often referred to as models (Velozo et al. 2006).

The three main models within IRT approaches relate ability to one or more parameters, grouped according to the one-, two- and three-parameter models (Velozo et al. 2006, Streiner 2008). All three models include the primary parameter of item difficulty, the two-parameter (2P) model additionally includes item discrimination and the three-parameter (3P) model includes guessing (Velozo et al. 2006). By adding parameters, the 2P and 3P models seek to explain variability within the data caused by more than item difficulty (Streiner 2008). However, in this sense the 2P and 3P models follow a more traditional statistical analysis approach rather than attempting to ensure that data from an assessment fits the tenets of true measurement (Bond and Fox 2015).

As the ACHIEVE Assessment is in the early stages of development and without prior quantitative analysis, it is not possible to know that it generates interval level data. Thus, without this pre-requisite to which parametric statistics can be applied, it is not appropriate to apply CTT approaches to evaluate the psychometric qualities of the ACHIEVE Assessment. Therefore, for the purposes of the evaluation study, IRT approaches were applied. In particular, to support analysis of the ACHIEVE Assessment as a true measure of a single construct, a 1P model was deemed appropriate. Rasch analysis is an approach that builds upon the IRT 1P model by requiring that data fit the model as expected, thus contributing to the development of robust measurement (Bond and Fox 2015). Rasch analysis methods were therefore utilised for the present study. In addition, Rasch analysis provides techniques for examining the unidimensionality and construct validity of an assessment that were considered valuable for evaluating the ACHIEVE Assessment.

Rasch analysis is a probabilistic, model-driven approach to evaluating the measurement qualities of assessments (McAllister 2008, Boone et al. 2014, Bond and Fox 2015). The basis of the Rasch model is the principle that quality measurement examines an attribute on a single hierarchical 'more than/less than' number line (Boone et al. 2014, Bond and Fox 2015). The primary assumption is that "a person having a greater ability than another person should have the greater probability of solving any item of the type in question, and similarly, one item being more difficult than another means that for any person the probability of solving the second item is the greater one" (Rasch 1960 cited in Bond and Fox 2015 p. 11). The logit equation applied to the raw data provides a means for mapping the ability of the children on the same interval 'ruler' as the difficulty of the items (McAllister 2008). This transformation supports a better representation of the distance between scores to allow exploration of whether the probabilistic relationship exists as predicted (Bond and Fox 2015).

In order to examine whether unidimensionality exists, Rasch modelling maps children and items against an ideal theoretical pathway (McAllister 2008). When data is found to 'fit' the pathway sufficiently, it is considered to represent a single line of inquiry. Achieving a single line of enquiry is an important basis for measurement and thus further investigations can be carried out to establish the quality of the assessment items in respect to the particular sample (Andrich 1988, Bond and Fox 2015). Examination of the pathway and associated statistics can then provide information about the extent to which the assessment items target the sample population and captures information about the attribute on a useful continuum that discriminates between children (McAllister 2008, Boone et al. 2014, Bond and Fox 2015).

As an approach that involves examining data for fit to or departure from a probabilistic model, Rasch analysis has received criticism for its use within healthcare research. In particular, authors criticise attempts to fit measurement of complex health concepts to a strict mathematical model (Heinemann et al. 2010). However, proponents of Rasch analysis emphasise that, in reality, real data will not perfectly fit the predictions of the Rasch model (Linacre 2013, Boone et al. 2014, Bond and Fox

2015). When applying the Rasch model to human measurement, the focus should be on achieving good enough fit rather than absolute fit (Linacre 2013, Bond and Fox 2015). Therefore, the aim of analysis in this study was to achieve a 'good enough' assessment by balancing conceptual underpinnings about children's participation with the ideal standards set by Rasch modelling.

The requirement for a single hierarchy of items is a further concern relating to Rasch analysis approaches. Authors emphasise that although aspects of participation may be more or less difficult it is not necessarily true that one is a requirement for another, as inferred within Rasch modelling (Whiteneck and Dijkers 2009). However, it is this hierarchical ordering of items and children along a logit scale that is a particular strength of Rasch analysis; allowing for validation of an assessment against conceptual understandings of the underlying concept (Bond and Fox 2015). Participation research indicates the influence that different settings, activity types and demands have on children's participation. Therefore, the ability to identify single or groups of items along a latent trait is considered a strength in this context and one which exploration of may lead to further theory development.

As Rasch analysis places child and item measures on an interval logit scale, it is then possible to apply parametric statistics to the resulting measures. Following analysis of the measurement qualities the ACHIEVE Assessment using Rasch modelling and generation of a final item and child set, the resulting measures will be used for further analysis. This second stage will draw on approaches from Rasch analysis and parametric statistics to compare parent and teacher reports of children's participation. For the purposes of this second stage of analysis, only children for whom there were parent and teacher questionnaires were included.

## 5.7 Programme of Work

The following sections outline the programme of work that was followed for the purposes of carrying out an evaluation of the ACHIEVE Assessment, using Rasch analysis. Sections 5.7.1 – 5.7.4 overview the processes involved in recruiting participants and collecting data. Sections 5.8.1 - 5.8.7 overview the steps taken to

analyse the measurement qualities of the ACHIEVE Assessment and section 5.8.8 includes steps taken to further compare parent and teacher report.

### 5.7.1 Sample Size Considerations

CTT analysis stipulates specific requirements for sample size based on power calculations. However, appropriate sample size recommendations for Rasch analysis are less specific (Boone et al. 2014, Bond and Fox 2015, Streiner et al. 2015). How effective the analysis is with a small data set depends on the structure of the assessment; including scale categories and number of items (Smith et al. 2008). The number of responses to an assessment affects the precision of item difficulty measures (Boone et al. 2014). In addition, when there are items located at similar levels to children, it enhances the ability to differentiate between those respondents (Bond and Fox 2015). Therefore, when there is an increase in the confidence in the item difficulty precision it improves the child estimates, which in turn support further examination of the assessment measurement qualities (Boone et al. 2014).

Thus, although it is possible to carry out Rasch analysis with small sample sizes of 30 or 50, it is beneficial to use larger samples to give confidence in the stability of item calibrations (Linacre 1994). There has previously been some indication that samples beyond a certain size can overinflate fit statistics, causing the identification of misfit where there is only minor evidence of such (Smith et al. 2008). However, Smith et al. (2008) report findings in which varying sizes of samples were taken from the same dataset and the findings compared. Mean square statistics remained relatively constant across all sample sizes.

Ultimately, a small sample size increases the standard errors of item measures, reduces the power of fit analysis and is more prone to accidents within the data (Linacre 1994). Linacre (1994) therefore suggests that for 99% confidence in the findings it requires a sample of at least 150 for most purposes. In addition to these considerations for all assessments, those with polytomous rating scales may require additional numbers to ensure there is adequate information to analyse category usage (Linacre 1994). Analysis of differential item function (DIF), a key process within Rasch analysis, requires at least 30 children, and ideally many more per distinct group

for analysis, meaning that to analyse DIF for three age groups would require at absolute minimum 90 children.

Therefore, due to the polytomous nature of the ACHIEVE assessment and the mixed literature about age and gender effects on children's participation, a minimum sample of 250 children was considered appropriate. Linacre (1994) suggests that a sample of 250 produces 99%+ confidence in item calibrations suitable for definitive analysis. However, due to the polytomous nature of the ACHIEVE assessment including a 4-point rating scale, the potentially widely heterogeneous sample and lower teacher than parent responses during initial collection, the decision was taken to continue collecting as much data as possible during the 10 month time scale.

### 5.7.2 Ethical Considerations

According to the Scottish Executive Health Department's Research Governance Framework, the "dignity, rights, safety and well-being of participants must be the primary consideration of any research study" (Scottish Executive Health Department 2006 p. 5). The following paragraphs detail steps taken to ensure that such ethical principles were upheld throughout the course of the study.

The study previously gained authorisation from the National Research Ethics Service (NRES) stating that full ethical approval was not required as it fell into the category of audit or evaluation (Appendix 3). As the questionnaires were being used as standard practice within NHS services in Scotland, an application was also made to the National Caldicott Guardian scrutiny panel. This panel ensures that NHS data is safeguarded and that patient confidentiality is protected by reviewing applications to access such information. The application was approved in full and no further amendments requested (Appendix 4).

The researcher made contact with relevant research and development (R&D) offices to gain local approval. Although the researcher had already gained Caldicott Guardian Approval for the study and deemed not to require full ethics approval, this step ensured that local R&D offices were aware of the study and any additional requirements could be adhered to in order to avoid breaching locality-specific

policies. The research protocol, NRES letter and data collection paperwork (participant information sheet, consent form, demographics sheet) were included with initial contact. For those services requesting it, further locality-specific forms were also completed. All of the R&D offices gave authorisation for the work to go ahead, with one service requesting a small amendment to wording in the parent information sheet to match their local protocol.

There was no requirement for readily identifiable information within the research; services were asked to remove any cover sheets or labels that they used to identify children's questionnaires before returning to the researcher. To ensure ethics principles were upheld, the researcher prepared a series of participant information sheets, consent forms (appendix 6) and demographics sheets (appendix 7). Participant information sheets (appendix 5) were designed for parents, explaining the purpose and importance of the study, in addition to detailing what participation would mean for them and their child. The researcher made clear in the information form, and in discussion with participating therapists, that non-consent from parents would not affect the care that families receive. Therapists could still use the ACHIEVE Assessment in the same process for children whose parents did not give consent as for those who did.

### 5.7.3 Recruitment

In order to optimize the data and to gather information from a sample that is reflective of the assessment's real-world usage, data recruitment involved practitioners using the ACHIEVE Assessment as their standard practice. The researcher had support from a clinical lead that facilitated initial contact with occupational therapy services across Scotland. In collaboration with the clinical lead, and prior to commencement of data collection, the researcher held a series of information events with staff from interested services.

The information events were held to support effective implementation of the ACHIEVE Assessment within the various service sites and, importantly, to ensure that the assessment was used equitably as intended across the whole sample. Equitable use of an assessment is important for upholding its validity and, within research

particularly, to ensure that analysis of an assessment reflects its intended use, thus reducing error in the results (Kielhofner 2006b). Initial contact with services occurred over a period of 7 months, prior to beginning data collection.

In order to maximize the amount of data that could be collected, all parents whose children were referred to participating services could be invited to participate in the study by consenting to use of their child's data. As the ACHIEVE Assessment manual states that it is suitable for all children ages 3-18 attending nursery or school, only children within these age ranges were considered relevant for inclusion in the study. No further inclusion or exclusion criteria were applied. However, services were aware that the questionnaires should only be completed by the parent or teacher themselves, not interview, as this would alter the data collection technique and, potentially, results.

The researcher printed copies of all versions of the ACHIEVE parent and education questionnaires, sufficient for services based on their projected referral numbers. In order to monitor use of the ACHIEVE Assessment and to aid data entry and analysis, the researcher used unique identifier codes to label each printed questionnaire. Each participating service received a package of ACHIEVE questionnaires and access to an online NHS portal to print copies of the participant information sheet, consent form and demographics sheet. Participating services also received a flow chart diagram that detailed the processes to follow when sending out and receiving questionnaires (Appendix 8).

Services carried out recruitment for data during the standard process of care, the researcher had no direct contact with parents, teachers or children. When issuing ACHIEVE Assessment questionnaires to parents, services also included participant information sheets and consent forms, inviting parents to participate in the research by giving consent to use of their child's questionnaires within the study. Participating services came from a variety of geographical areas including cities, towns and rural areas.

### 5.7.4 Data Collection and Management

When services received consent from parents, they completed the demographics sheet and collated copies of the parent and education questionnaires with the research paperwork. In the event of parent questionnaires being returned with consent but non-return of education questionnaire, services kept the parent copy until the end of data collection. Any parent questionnaires that did not have a corresponding education version were still included in the data set at the end of collection, with adjustments made where relevant for overall comparison of parent and teacher report.

Participating services then compiled and securely stored the paperwork on site. The researcher organised times to collect the data in person. As the services were geographically spread across a large area, the researcher arranged uptake of the questionnaires on an individual basis towards the end of the data collection phase. The researcher used a locked case in all instances and transferred the questionnaires directly to a locked cupboard within a secure staff area of the university, according to the protocols submitted to the Caldicott Guardian and R&D offices. The cupboard was accessed only by the researcher and the key kept within separate locked storage.

## 5.8 Data Entry and Analysis Procedure

Services submitted questionnaires in their pair sets and the researcher used the identifier codes to ensure that these remained linked during the data entry and analysis process. The researcher initially entered the data into SPSS (IBM Corp. 2012) for descriptive analysis and electronic storage. Details from children's demographics sheets were also included in the SPSS files. Data files were stored on a limited access drive on the university network. The drive was accessible only to designated users through password protected login.

Rasch analysis is suitable for use with missing data (Boone et al. 2014, Bond and Fox 2015); therefore, the researcher input all questionnaires that had been returned with consent, whether or not all questions had been completed. In addition to allowing

analysis using a larger data set, this supported identification of specific questions that received lower responses.

Data from the SPSS forms was then imported into Winsteps (Linacre 2016a) and control files checked to ensure correct data coding, including setting up the data so that missing data codes were not included as valid responses in Winsteps. SPSS was used for initial data entry, storage and descriptive analysis as Winsteps has limited functionality for these purposes. The respondent, child's gender, child's age (years) and reasons for referral were included in the child label information in the Rasch control file to support in-depth examination of the data. No additional specifications, item removal or child selection were applied during the initial stages of analysis. The software follows a process of calibrating item difficulties and child abilities that then form the basis of identifying the expected responses for every child and item (Linacre 2013, Bond and Fox 2015). Residuals are calculated to express the difference between the actual observed response and the expected response according to the Rasch model (Bond and Fox 2015).

Rasch analysis is typically an iterative process, wherein any change such as child or item removal, category collapse or code rescoring requires a re-examination of the overall measures and fit statistics (Linacre 2013, Bond and Fox 2015). It is often the case that removing one misfitting item or person will result in further items or children showing as under/overfitting that did not previously do so (Bond and Fox 2015). Similarly, when examining dimensionality it is important to demonstrate that any resulting sub dimensions warrant separation from the overall assessment (Linacre 2009, Linacre 2013).

Ultimately, carrying out Rasch analysis requires awareness of the interaction between theory, items expressing theory and children in the sample (Boone et al. 2014). Therefore, throughout analysis, a record was kept of iterative steps and, where changes were made to the control file, copies made so that the original was maintained. Potential problematic items and children were identified and examined in further detail to explore impact on measurement quality. There are several aspects of Rasch analysis important for consideration when evaluating assessments. The following sections overview the steps of analysis followed in the current study.

### 5.8.1 Rating Scale Function

Before checking the fit of items to an overall latent trait, for polytomous assessments it is important to evaluate the strength of the rating sale (Boone et al. 2014, Bond and Fox 2015). An initial assessment can be made by verifying that the category usage reflects a spectrum of agreement (Boone et al. 2014). Responses to an assessment should make sense in terms of the underlying latent trait, with average child measure increasing along the rating scale categories (Boone et al. 2014, Bond and Fox 2015). For example, for the ACHIEVE Assessment, mean child measures should increase from category 1 'none of the time', through categories 2 and 3, to category 4 'all of the time'.

One of the primary checks when analysing rating scale function is to examine the category probabilities. Assessments that fit the Rasch model should demonstrate predictable use of scale categories for each item. Each category on a rating scale should be the 'most probable' category at some point relative to the scale of item difficulty and child ability (Boone et al. 2014, Bond and Fox 2015). When a category is never the most probable, it may not be usefully collecting information for the purposes of measurement (Boone et al. 2014).

There are two Rasch models for polytomous data; the rating scale model (RSM) and partial credit model (PCM). The RSM requires all items on an assessment to have the same number of categories and treats them with equivalent thresholds (Bond and Fox 2015). In contrast, the PCM is unconstrained, allowing different thresholds and numbers of categories between items (Bond and Fox 2015). Therefore, in instances when an assessment's category function varies between items, it is appropriate to adopt the PCM instead of the RSM; however doing so creates a more complex model. As all of the items on the ACHIEVE Assessment use the same rating scale structure, the RSM was appropriate for initial analysis in the current study. However, if category function was found to vary between items, the PCM would instead be applied.

### 5.8.2 Item Polarity

The next step in analysis is to check the polarity of the assessment items to ensure that each item aligns with the overall construct using the point-measure correlations. Negative correlations, or correlations that are noticeably smaller than others on the assessment are, indicate that an item is not consistent with the overarching construct and warrants further attention to check for subdimensions (Linacre 2013). Rather than adopting specific cut off points, it is better to compare the observed correlation with the expected correlation to determine whether the size of correlation is appropriate (Linacre 2013). In the case of a negative correlation, it may be that the item requires reverse scoring to reflect the use of negative wording.

### 5.8.3 Wright Map: Child-Item Targeting

The Wright Map, also known as a 'child-item' map is a useful tool for examining how an assessment defines the latent variable, identifying initial strengths and weaknesses, and documenting the item hierarchy according to the sample group (Boone et al. 2014, Bond and Fox 2015). This step in analysis is beneficial for identifying the success of the assessment in measuring a concept along various 'portions' of the latent variable; i.e. low, medium and high (Bond and Fox 2015). In order to produce measurement that captures the full range of a latent variable it is essential to have items that are placed consistently and evenly along the scale (Boone et al. 2014). Importantly, the Wright Map plots items and children, providing a visualization of the relationship between the two, which supports analysis of the extent to which the items appropriately target children (Boone et al. 2014).

Children and items are plotted on the same interval logit scale, meaning that equal distances at any point on the scale represent equal amounts of the latent variable (Bond and Fox 2015). Where a child measure location matches an item measure, that child is said to have a 50% probability of endorsing either the higher categories or lower categories (Bond and Fox 2015). Examination of the Wright Map can indicate location of the means on the logit scale and skewing of children towards one end of the measured latent variable, thus indicating whether an assessment is too 'easy' or 'difficult' for the sample in question (Boone et al. 2014, Bond and Fox 2015). A child

distribution that is top heavy in comparison to the item distribution indicates a potential ceiling effect, meaning that the assessment is too easy for respondents to endorse and provides little useful information about children with higher levels of participation (Bond and Fox 2015).

Wright Maps provide a useful initial examination of the data, offering an indication of the spread of items and children relative to each other. However, Wright Maps do not provide statistics for precision, fit or reliability that are required for thorough analysis (Bond and Fox 2015). Additional output tables, plots and graphs within Winsteps provide scope for a thorough comparison of the assessment against the Rasch measurement model, as overviewed below.

### 5.8.4 Summary Statistics

Summary tables within Winsteps provide an overview of the entries included within the analysis for items and children separately. Summary statistics are given as both raw and logit values. Standard deviations and means, also included within the Wright Map, provide an indication of the spread of the items or children along the latent variable. This information is supplemented by the item and child reliability statistics, interpreted similarly to a Cronbach's reliability alpha within CTT, which give an indication of the confidence in estimations resulting from the amount of information available.

Reliability statistics are heavily influenced by the sample size, with large sample sizes more likely to produce high item reliability. In addition, those items or children that have corresponding children/items targeted at their level on the latent variable will have more information determining their measure (Linacre 1994, Bond and Fox 2015). However, coupled with separation statistics, reliability gives a useful indication of the ability of the assessment to define a hierarchy of children along a latent variable in distinct groups (Linacre 1994, Bond and Fox 2015). Higher separation and reliability values also indicate greater confidence in the replicability of the estimations across other samples (Bond and Fox 2015). Boone et al. (2014) recommend a reliability of at least 0.9 for a minimum separation of 3 or 4 groups.

Mean child ability closely matching the mean item difficulty (arbitrarily set at 0.0) improves measurement precision (Bond and Fox 2015). Large negative mean child ability indicates the respondents finds the assessment 'difficult' to endorse whereas large positive mean child ability indicates they find it relatively 'easy' (Bond and Fox 2015). When the mean item difficulty exactly matches mean child ability, it may indicate optimal targeting. However, interpretation of targeting will depend on the assessment setting, for example, the psychological benefit of a majority of participants having a higher ability than item difficulty (Boone et al. 2014). However, for the purposes of the ACHIEVE Assessment, a clinical assessment, it was considered more important to capture an accurate representation of children's participation and thus close to average targeting desirable.

### 5.8.5 Fit Statistics

One of the core set of parameters used within Rasch analysis to examine assessment quality is fit statistics. Fit statistics provide a quantitative description of how well individual items and children fit the Rasch model of measurement (Wu and Adams 2007, Boone et al. 2014). When data does not fit the Rasch model a divergence, misfit, is said to exist and careful evaluation of the potential cause is necessary (Boone et al. 2014, Bond and Fox 2015). Fit statistics can provide an indication of whether the assessment is a true measure of a single construct (Bond and Fox 2015). In this sense, fit statistics echo construct validity, as is often referred to within CTT. Misfit from the model can vary in size and whether it is explainable using underlying theory (Boone et al. 2014).

Mathematical models such as Rasch describe an unattainable idealisation that does not perfectly reflect real world complexities (Bond and Fox 2015). Multiple factors can cause misfit in the data, including guessing, inter-dependency between items, and individual items capturing more than one trait or groups performing in different ways on the same item (Wu and Adams 2007). Therefore, analysis should focus on obtaining a 'good enough' fit for the purpose for which the assessment is intended (Bond and Fox 2015).

Fit statistics are based on residuals within the data (Wu and Adams 2007). The two primary parameters used are Mean Square statistics (MnSq) and standardised Z scores (ZSTD). Both of these statistics are reported for INFIT and OUTFIT which examine the data differently. INFIT is an information weighted statistic that is calculated on responses close to a child's ability or item's difficulty, where some randomness is expected within the data (Linacre 2013, Boone et al. 2014). OUTFIT provides a score for the data at the upper and lower ranges of a child's ability/item difficulty, meaning that the statistic is sensitive to outliers (Boone et al. 2014). Problematic OUTFIT statistics are generally less of an overall threat to measurement than INFIT, however they are easier to identify and remedy thus recommendations point to examining these first (Linacre 2013, Boone et al. 2014).

MnSq statistics show the size of randomness, the extent to which there is distortion from the measurement model for each item and child (Linacre 2002, Boone et al. 2014). Mean squares are always positive, with 1.0 being the expected value demonstrating ideal fit to the measurement model (Linacre 2002). Although values above and below 1.0 both show deviation from the ideal measurement model, values greater than 1.0 are typically of the greatest concern as they suggest that the data is unpredictable and may indicate a distortion in the way that the assessment measures children (Linacre 2002, Bond and Fox 2015). Although overfitting items (MnSq<1.0) add less statistical information, they do no harm to the overall measurement (Linacre 2002). In addition, MnSq scores are forced to average at approximately 1.0, thus when items within an assessment exhibit large MnSq >1.0, other, overfitting, items are forced to have low MnSq values.

ZSTD scores are given alongside MnSq. Standardised fit statistics are results from t-tests for the question "does this data fit the model perfectly?" and are reported as Z-scores (Wu and Adams 2007). The expected value for ZSTD is 0 with a standard deviation of 1 (Boone et al. 2014). ZSTD is a useful examination of the strength of item misfit, indicating the probability that the MnSq occurs by chance (Boone et al. 2014). However, while MnSq results remain largely unaffected by sample size, large samples can overinflate Z-scores and thus show significance of misfit where the extent is quite small (Wu and Adams 2007, Bond and Fox 2015). When MnSq and ZSTD do not give

comparable indications of fit they therefore need to be interpreted 'on balance' (Bond and Fox 2015).

Linacre (2013) highlights that as the recommended fit criteria were formulated by statisticians, they often prove too restrictive to assessment developers interested in overall measurement quality rather than component parts. Boone et al. (2014) therefore suggests that as long as MnSq is within an acceptable range there is less need to address large ZSTDs. Therefore, for the present study an approach was taken first to examine the OUTFIT MnSq scores, followed by INFIT MnSq to identify misfitting items or children. The determination of MnSq intervals are largely arbitrary with values <0.5 or >1.5 indicated as general parameters (Smith 1996). Table 5-1 includes suggestions for guidelines from Wright and Linacre (1994) depending on the purpose of the study:

**Table 5-1 - Reasonable Mean-Square Ranges for INFIT and OUTFIT**

| Type of Test | Range |
|---|---|
| MCQ (High stakes | 0.8 - 1.2 |
| MCQ (Run of the mill) | 0.7 - 1.3 |
| Rating scale (survey) | 0.6 - 1.4 |
| Clinical observation | 0.5 - 1.7 |
| Judged (agreement encouraged) | 0.4 - 1.2 |

For the purposes of this study, MnSq <0.7 or >1.3 were considered misfitting and further investigation undertaken. To reflect the large sample size of the data, ZSTD was only examined alongside MnSq, thus ZSTD >2.0 was not considered of concern unless accompanied with an underfitting MnSq value. Following exploration of items with large OUTFIT values, additional items showing potential problems of INFIT were then examined.

Although Rasch analysis provides useful information about the fit of children and items, these statistics require examination in the context of theory about the latent variable and sample population (Linacre 2002, Boone et al. 2014, Bond and Fox 2015). Importantly, although fit statistics can identify problematic children or items, this should not automatically translate to removal but prompt further investigation for the potential cause of problems (Bond and Fox 2015). Therefore, instances of

misfit were not considered sufficient to warrant item removal within the current study. Instead, such indications of problems within the data would trigger further exploration in line with theoretical underpinnings.

### 5.8.6 Principle Components Analysis

In addition to checking the point-measure correlations and fit to the Rasch model, it is useful to carry out further examination of dimensionality (Boone et al. 2014, Bond and Fox 2015). It is a distinctive feature of Rasch that the model requires one underlying theoretical construct to the assessment (Bond and Fox 2015). Principle component analysis (PCA) uses residuals in the data to identify additional dimensions beyond the latent variable that affect the response patterns (Bond and Fox 2015). As with other aspects of Rasch analysis, although PCA can detect common variance in the residuals suggesting additional dimensions, these are not always meaningful (Linacre 2013, Bond and Fox 2015).

Consideration of the size of variance, in addition to the nature of items within possible additional dimensions is therefore important (Linacre 2009, Bond and Fox 2015). Contrasts of greater than 2 eigenvalues are often considered problematic, however for longer assessments it is relevant to focus on the percentage of variance, with values over 5% warranting further investigation. In addition, how closely the observed variance matches the Rasch stipulated expected variance is also important (Linacre 2013). Where closely related items are identified as causing variance as an additional dimension it may then be cause for removal or steps taken for an additional sub scale.

### 5.8.7 Differential Item Function

Differential item function (DIF) analysis is a method for examining measurement bias affecting specific groups as relevant to a particular assessment (Wu and Adams 2007, Boone et al. 2014). An important distinction when examining DIF is recognising that differences in child measure between subgroups is not necessarily an indication of bias but may represent a genuine difference in performance (Boone et al. 2014, Bond and Fox 2015). However, although groups of children may perform differently on a

questionnaire, ideally the way that the questionnaire functions should not vary (Boone et al. 2014). It is when the location of items along the latent trait differ as a function of subgroup that there is a possible indication of DIF (Boone et al. 2014). Initially, DIF was examined for age and gender. On completion of data inputting, additional groups for DIF analysis were identified according to reasons for referral frequencies.

Presence of DIF on one assessment item can affect the measures of all children, and therefore items, thus potentially influencing the validity of conclusions based on those statistics (Boone et al. 2014). When DIF is indicated for an item or items, it is not necessarily cause for removal depending on the other item characteristics and implications for the underlying construct (Boone et al. 2014, Bond and Fox 2015). Instead, steps can be taken that ensure the item is treated differently for subgroups in terms of generating child measures (Wu and Adams 2007, Boone et al. 2014).

Winsteps provides information about different child measures for selected subgroups, the DIF contrast between groups and a probability statistic for each (Boone et al. 2014). The next step in the analysis was therefore to check these tables, first reviewing the probability statistics that express the magnitude of difference, using $p \leq 0.05$ as the typical cut-off (Boone et al. 2014). However, as with fit statistics, statistically significant DIF may have little meaningful impact (Wu and Adams 2007). Therefore, the 'effect size', or DIF contrast, for items showing significant difference was then checked to determine how meaningful the size of DIF is in terms of the potential impact on the whole assessment (Boone et al. 2014). Values >0.64 are suggested as showing moderate-large DIF and thus were identified for further investigation, however subjective judgment is also necessary (Wu and Adams 2007, Boone et al. 2014).

### 5.8.8 Use of Rasch Measures for Further Exploration

In addition to analysis of DIF between groups, analysing DIF according to respondent allows identification of those items that remain invariant between parents and teachers. Using an anchoring approach then allows comparison of child scores across the invariant items between respondents. In order to examine the similarities and

differences between the two respondents' reports, correlational and mean comparison analyses including t-tests will be utilised. Such an investigation of respondents' perceptions will be useful in furthering understandings of how to measure and conceptualise children's participation.

Given the contextual nature of participation, the complexity of the construct and previously reported discrepancies between parent and teacher report of aspects of children's behaviour indicates that differences are to be expected. However, as both respondents are ultimately reporting on the same child it is anticipated that there will be some similarities. Correlational analyses will be carried out between respondents on the assessment as a whole and on individual sections. Examination of child measures between respondents will allow comparison of patterns, for example, whether certain groups score consistently higher than another does on particular sections.

## 5.9 Summary

Using measurement to quantify child attributes and performance is a central aspect of healthcare practice and research. The increasing priority of participation has therefore resulted in growing numbers of assessments to measure children's participation. Unlike other assessments, the ACHIEVE Assessment provides a means of gathering information about children's participation across home, school and community settings as reported by their parents and teachers.

Ensuring the quality of such assessments involves developing assessments that capture a single construct along a hierarchical line. Classical approaches to assessment analysis have been shown to be problematic when applied to data not known to be interval. Rasch analysis has therefore risen in popularity as an approach to evaluating the measurement qualities of assessments. Although application of Rasch within healthcare has been criticised by some, the particular strengths of the approach were considered beneficial within the context of the current study.

Therefore, a national study was carried out to collect data from use of the ACHIEVE Assessment in practice. All parents of children with whom participating therapists

chose to use the assessment were invited to consent to inclusion of their child's data within the study. Parent and teacher questionnaires were then collated and inputted into Rasch analysis software Winsteps to complete evaluation of the ACHIEVE Assessment's measurement qualities. Child-item maps, fit statistics, DIF and PCA were all examined to check fit of the assessment to the Rasch model, evaluate dimensionality and control for bias between groups. The following chapter details the results from the analysis.

# Chapter 6 – Results

## 6.1 Introduction

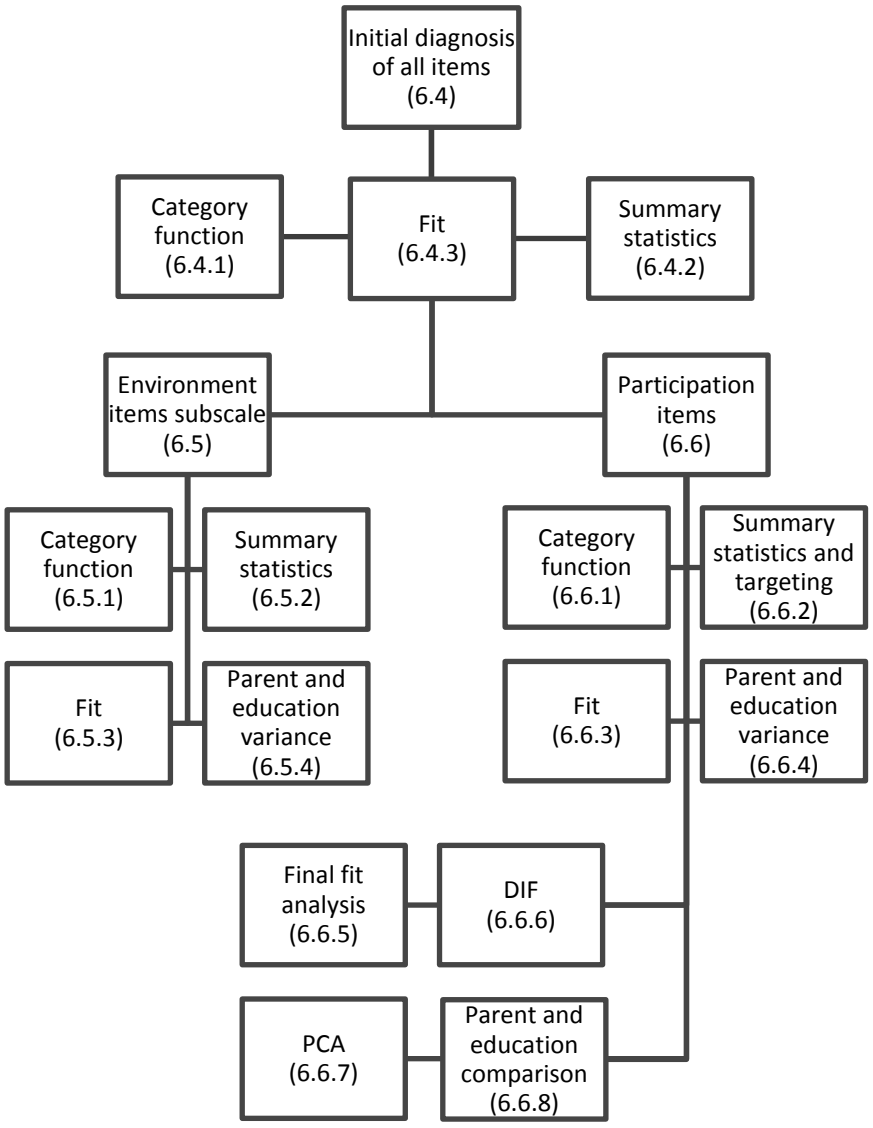
Participation is a complex construct that warrants further attention within research in order to advance its conceptualisation. In particular, developing strategies for measuring children's participation enhances understandings and thus contributes to conceptualisation efforts. The preceding chapters overviewed current knowledge about children's participation, as reported in recent research. In particular, research indicates that a complex interaction of personal and environmental characteristics influences the extent and diversity of children's participation. However, existing research investigates children's participation in home or community settings, with less information available about children's participation at school.

The purpose of the current research was therefore to analyse an assessment of children's participation as completed by their parents and teachers, capturing home, school and community settings. The current chapter includes details of the data analysis findings. The iterative nature of Rasch analysis is such that aspects of interpretation are required as analysis progresses. Therefore, accompanying the report of findings, there is some initial discussion relevant to implications for analysis of the ACHIEVE Assessment. In addition to analysis of the ACHIEVE Assessment, the chapter includes results from further analysis on comparison of the child measures from the separate respondents.

The chapter begins with an examination of the characteristics of children in the study sample (6.2). The following section (6.3) then includes details of the data completion rates. From section 6.4 onwards, the chapter structure follows the steps within the flowchart in figure 6-1, beginning with an initial analysis (category function, fit and summary statistics) of the full assessment. Following an initial analysis the chapter reports results of an analysis of the environment items, then participation items separately. The findings then report analysis of DIF between parent and teacher report, before finally reporting a fit analysis of the full assessment of participation

items, examination of the item hierarchy, and statistical comparison of parent and teacher report of children's participation.

**Figure 6-1 - Results flowchart**




## 6.2 Sample Characteristics

In the present study, parents and teachers of 402 children participated from occupational therapy services in 11 Scottish health boards including urban and rural areas. In total, services returned 401 parent and 335 education questionnaires, resulting in a final data set of 736 questionnaires. One child's parent had completed

the consent form, however did not complete the questionnaire - only an education form was available. Therefore, there were 334 questionnaire pairs.

**Table 6-1 - Sample Characteristics**

| Age (years) | N | % |
|---|---|---|
| 3.5 – 4.4 | 25 | 6.2 |
| 4.5 – 5.4 | 35 | 8.7 |
| 5.5 – 6.4 | 86 | 21.4 |
| 6.5 – 7.4 | 52 | 12.9 |
| 7.5 – 8.4 | 42 | 10.4 |
| 8.5 – 9.4 | 49 | 12.2 |
| 9.5 – 10.4 | 47 | 11.7 |
| 10.5 – 11.4 | 15 | 3.7 |
| 11.5 – 12.4 | 14 | 3.5 |
| 12.5 – 13.4 | 12 | 3.0 |
| 13.5 – 14.4 | 5 | 1.2 |
| 14.5 – 15.4 | 4 | 1.0 |
| 15.5 – 16.4 | 2 | 0.5 |
| 16.5 – 17.4 | 2 | 0.5 |
| Not completed | 12 | 3.0 |

| Ethnicity | N | % |
|---|---|---|
| White Scottish | 306 | 76.1 |
| White English | 4 | 1.0 |
| White Welsh | 1 | 0.2 |
| White British | 20 | 5.0 |
| White Gypsy/Traveller | 1 | 0.2 |
| White Polish | 4 | 1.0 |
| Any other white group | 2 | 0.5 |
| Mixed/multiple ethnic group | 1 | 0.2 |
| Chinese group | 1 | 0.2 |
| African group | 1 | 0.2 |
| Unknown/Not completed | 61 | 15.2 |

| Gender | N | % |
|---|---|---|
| Female | 81 | 20.1 |
| Male | 315 | 78.4 |
| Not completed | 6 | 1.5 |

| School placement | N | % |
|---|---|---|
| Language class | 1 | 0.2 |
| Mainstream | 336 | 83.6 |
| Nursery | 41 | 10.2 |
| Special needs school | 3 | 0.7 |
| Not completed | 21 | 5.2 |

| Referral source | N | % |
|---|---|---|
| School - NS | 84 | 20.9 |
| Doctor - Paediatrician | 69 | 17.2 |
| Other education | 39 | 9.7 |
| School - Doctor or Nurse | 31 | 7.7 |
| School - Head Teacher/Deputy | 24 | 6.0 |
| Other medical | 23 | 5.7 |
| AHP | 22 | 5.5 |
| School - Support for Learning Staff | 17 | 4.2 |
| Doctor - GP | 16 | 4.0 |
| School - Teacher | 12 | 3.0 |
| CAMHS | 6 | 1.5 |
| Parent | 4 | 1.0 |
| School and Medical | 2 | 0.5 |
| Not completed | 53 | 13.2 |

Table 6-1 displays demographic information about children included in the study. The mean age of children included in the study is 7.91 years (S.D. = 2.61 S.E. = 0.13), range = 14 years. The mean age of children therefore skews towards younger children; 49.2% of the children are under 7.5 years old. The mean age of boys is 7.92 years (SD = 2.63) and the mean age of girls is 7.89 years (SD = 2.57). Of the parent

questionnaires, 48.4% were standard versions, 44.9% were DCD versions and 6.7% ADHD versions.

Table 6-2 includes information from the diagnosis entries on the demographics sheet. In total 70% of the children did not have specific diagnostic information on their demographics sheets. Some children had multiple diagnoses.

**Table 6-2 - Diagnoses**

| Diagnosis | N | % of all |
|---|---|---|
| ASD | 33 | 8.2 |
| DCD | 18 | 4.5 |
| Hypermobility | 18 | 4.5 |
| ADD | 11 | 2.7 |
| Visual impairment | 11 | 2.7 |
| Learning difficulty | 9 | 2.2 |
| Congenital/Chromosomal | 7 | 1.7 |
| Speech and language | 7 | 1.7 |
| Brain Injury | 6 | 1.5 |
| Developmental delay | 6 | 1.5 |
| Other medical | 5 | 1.2 |
| Respiratory | 5 | 1.2 |
| Epilepsy/Seizures | 4 | 1.0 |
| Other - sensory | 4 | 1.0 |
| Premature | 4 | 1.0 |
| Other | 4 | 1.0 |
| Cancer/tumours | 3 | 0.7 |
| Other behavioural/mental health | 3 | 0.7 |
| FASD | 2 | 0.5 |
| No entry/None known | 282 | 70.0 |

The reasons for referral counts are available in Table 6-3. The format of the demographics form, allowing multiple selections, means that there are more total reasons for referral than there are children. Further, some children had conditions listed within the diagnoses entry that are not identified as a reason for referral. The difference may relate to existing conditions that are not the focus of the most recent referral.

More children have DCD as a reason for referral than ASD, however there are more diagnostic entries including ASD than DCD. Where there was missing data within demographics forms, attempts were made to retrieve this information from services,

using questionnaire identifier codes. However, as the questionnaires were anonymised, filing and record procedures within services meant that it was not possible to obtain all of the missing information.

**Table 6-3 - Reasons for Referral and Additional Support Needs (ASN)**

| Reasons for referral | N | % of all | ASN | N | % of all |
|---|---|---|---|---|---|
| Fine motor | 251 | 62.4 | Motor Skills | 120 | 29.9 |
| Gross motor | 218 | 54.2 | Self-care | 49 | 12.2 |
| Handwriting | 181 | 45.0 | Learning/Mental | 48 | 11.9 |
| Organisation | 107 | 26.6 | Unknown | 46 | 11.4 |
| DCD | 89 | 22.1 | Additional supports | 39 | 9.7 |
| Dressing/washing | 85 | 21.1 | Communication | 36 | 9.0 |
| Sensory processing | 78 | 19.4 | Vision | 16 | 4.0 |
| ASD | 52 | 12.9 | Hearing | 5 | 1.2 |
| Academic/School | 43 | 10.7 | Missing/no entry | 162 | 40.3 |
| Social Interaction | 36 | 9.0 | **Reasons for referral count** | **N** | **% of all** |
| Feeding/Drinking | 35 | 8.7 | 3 | 94 | 23.4 |
| Behavioural or Mental Health | 26 | 6.5 | 2 | 92 | 22.9 |
| Visual or auditory problems | 23 | 5.7 | 4 | 74 | 18.4 |
| Developmental Delay | 21 | 5.2 | 1 | 56 | 13.9 |
| ADD | 20 | 5.0 | 5 | 34 | 8.5 |
| Learning Disability | 8 | 2.0 | 6 | 17 | 4.2 |
| Prematurity | 7 | 1.7 | 7 | 13 | 3.2 |
| Seizures or Epilepsy | 3 | 0.7 | 8 | 5 | 1.2 |
| Cerebral Palsy or ABI | 2 | 0.5 | 9 | 3 | 0.7 |
| Equipment | 1 | 0.2 | 10 | 2 | 0.5 |
| Missing/no entry | 10 | 2.5 | 11 | 1 | 0.2 |
| | | | Missing | 11 | 2.7 |

**Table 6-4 - Most frequent reasons for referral combinations**

| Reason for referral combination | Count |
|---|---|
| Fine motor, gross motor | 23 |
| Fine motor, gross motor, and handwriting | 16 |
| Fine motor, Handwriting | 15 |
| DCD | 13 |
| Fine motor, gross motor, sensory processing | 10 |
| Fine motor, gross motor, organisation, handwriting | 10 |
| Gross motor | 10 |
| Handwriting | 10 |
| Sensory processing | 9 |
| DCD, fine motor, gross motor | 8 |

There were 210 combinations of reasons for referral identified on the demographics sheets.

Table 6-4 lists the 10 most frequent combinations of reasons for referral.

## 6.3 Data Completion

Following input of the combined set of parent and education questionnaire data (N = 736) into Winsteps, the control file was generated and checked to ensure that the correct coding was used, item and child labels included, and relevant child demographics listed as separate variables to support in-depth analysis. A copy of the original control file, without data entries, as used in the initial analyses is available in appendix 10.

Appendix 9 includes a table of response counts for each item for parent and education questionnaires separately and collectively. Missing responses ranged from four for items LA3 “Manages clothes” and LA6 “Manages snacks” to 33 for item CA3 “Participates in out of school clubs” on the parent questionnaires. Missing responses on the teacher questionnaires ranged from for on item OR2 “Maintains concentration” to 123 on item CA2 “Play in organised activity”. On average, there are 20.6% fewer complete CA responses on the teacher questionnaires than parent questionnaires, in comparison to <5% difference on all other sections between respondents. The larger difference in completion on the Community Activities section may result from teachers not viewing the items as relevant to their perspective of children within school. The only section with more incomplete responses is the Emotions and Sensations section which is only included in the ‘ADHD’ version of the ACHIEVE Assessment questionnaire which had fewer returns than the standard and DCD versions.

## 6.4 Initial Analysis of all Items

The following sections overview findings from the Rasch analysis of the ACHIEVE Assessment using the complete, combined data set. The outputs therefore relate to 736 sets of scores across 54 items.

### 6.4.1 Category Function

Boone (2014) recommends checking the category function of the rating scale before carrying out further assessment. Figure 6.2 displays the category probabilities for the whole assessment in relation to the child ability minus item difficulty (Bn-Di). The category probabilities graph confirms the hierarchical ordering of the categories inferred in the table. As children's Rasch-calibrated ability increases beyond item difficulty, the probability of parents endorsing categories increases sequentially. Importantly, each category is the most probable at some point according to child ability relative to item difficulty.

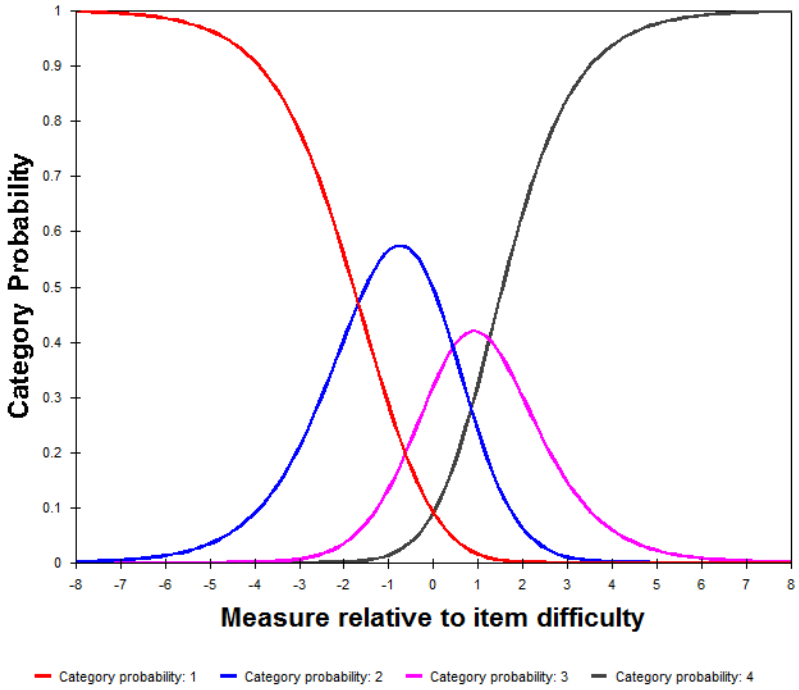
The results therefore indicate predictable use of the categories on the rating scale, as required by the Rasch model (Boone et al. 2014, Bond and Fox 2015). Category 3, "most of the time", has the least probability, however as it is the most probable at some point along the scale provides evidence that it collects information useful for measurement (Boone et al. 2014). Therefore, the category probabilities are sufficient to warrant the maintenance of each within the rating scale.

Figure 6-2 and Table 6-5 include information about the overall category structure. Category 1, "none of the time", has the fewest observations, however this is not necessarily a cause for concern and may reflect the construct of interest. Importantly, the observed average measure, Andrich thresholds and category measures increase in line with the category label, indicating that the categories capture increasing levels of the latent trait (Boone et al. 2014, Bond and Fox 2015). Therefore, no adjustments were made to the category structure.

**Table 6-5 - Category function information**

| Category | Count | % | Category measure | Threshold | Average child measure |
|---|---|---|---|---|---|
| **1 "None of the time"** | 3530 | 10 | ( -2.86) | NONE | -0.87 |
| **2 "Some of the time"** | 11666 | 34 | -0.74 | -1.68 | -0.10 |
| **3 "Most of the time"** | 10210 | 29 | 0.91 | 0.44 | 0.71 |
| **4 "All of the time"** | 9322 | 27 | -2.59 | 1.25 | 1.66 |

**Figure 6-2 - Initial analysis category probabilities**




### 6.4.2 Summary Statistics and Targeting

Table 6-6 below includes the summary statistics for the initial analysis, including data from both parent and education questionnaires. Winsteps identified one extreme child and no extreme items. Extreme children are those with maximum raw scores across all items. The extreme child has had a minimal impact on the overall measures. The extreme child was from a parent-report, the corresponding education report, although not extreme, also places the child at the upper end of the latent trait, with a measure of 3.21, over 2.5 SDs away from the mean. The demographics information for this child does not include a diagnosis, and their reasons for referral pertain to fine motor skills, organisation and handwriting; the three most frequently reported reasons for referral. Boone et al. (2014) advise that entries with extreme scores do not provide useful information and instead skew the results. Therefore, further analysis excludes the child with extreme scores; however, their information is maintained within the data file for future use if necessary.

**Table 6-6 - Summary statistics - full set**

| Summary of 735 non-extreme children | | | | |
|---|---|---|---|---|
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 128.70 | 47.20 | 0.53 | 0.21 |
| **P.SD** | 28.50 | 4.00 | 1.06 | 0.05 |
| **S.SD** | 28.50 | 4.00 | 1.06 | 0.05 |
| **MAX.** | 195.00 | 54.00 | 5.35 | 1.00 |
| **MIN.** | 42.00 | 18.00 | -2.51 | 0.18 |
| **Real** | **Separation** | 4.50 | **Reliability** | 0.95 |
| **Model** | **Separation** | 4.85 | **Reliability** | 0.96 |
| **S.E. of mean** | 0.04 | | | |
| **Summary of 736 extreme and non-extreme children** | | | | |
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 128.80 | 47.20 | 0.53 | 0.21 |
| **P.SD** | 28.60 | 4.00 | 1.08 | 0.08 |
| **S.SD** | 28.60 | 4.00 | 1.08 | 0.08 |
| **MAX.** | 196.00 | 54.00 | 6.56 | 1.83 |
| **MIN.** | 42.00 | 18.00 | -2.51 | 0.18 |
| **Real** | **Separation** | 4.41 | **Reliability** | 0.95 |
| **Model** | **Separation** | 4.72 | **Reliability** | 0.96 |
| **S.E. of mean** | 0.04 | | | |
| **Child raw score-to-measure correlation = 0.92** | | | | |
| **Summary of 54 non-extreme items** | | | | |
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 1755.20 | 643.10 | 0.02 | 0.07 |
| **P.SD** | 570.80 | 192.00 | 0.69 | 0.04 |
| **S.SD** | 576.20 | 193.80 | 0.70 | 0.04 |
| **MAX.** | 2563.00 | 726.00 | 1.50 | 0.21 |
| **MIN.** | 93.00 | 46.00 | -1.88 | 0.05 |
| **Real** | **Separation** | 8.33 | **Reliability** | 0.99 |
| **Model** | **Separation** | 8.65 | **Reliability** | 0.99 |
| **S.E. of mean** | 0.09 | | | |

Child and item reliability are both above the recommended minimum 0.9 necessary for confidence in the measure calibrations (Linacre 1994, Boone et al. 2014). Child and item separation indexes further confirm this finding. Using equation 'H = (4G+1)/3', where G = child separation, indicates that the assessment separates children into at least 6 levels. No further adjustments were made at this stage based on summary statistics.

**Figure 6-3 - Child-Item histogram**

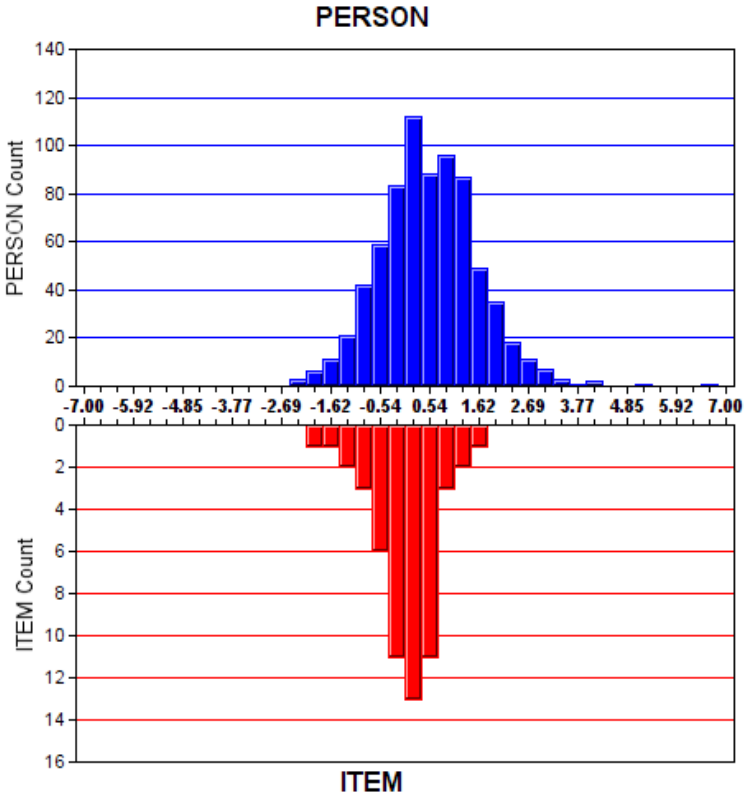



Figure 6-3 is a histogram of children (labelled as "PERSON") and items. The plot distribution indicates that children with measures between -2 and +1.5 logits have ACHIEVE Assessment items targeted at their ability level. The bars in the top half of the figure indicate a count of children according to Rasch ability measure and the bars in the bottom half of the figure indicate a count of items according to difficulty. The location of children along the upper end of the scale, beyond where any items are located, may indicate a potential ceiling effect within the assessment data.

The Wright Map in Figure 6-4 similarly plots the placement of the children and items along the same logit scale based on their ability (children) or difficulty (items). Children are plotted on the left; each "#" represents 5 children and each "." represents 4 children. Items are plotted on the right with their labels. Where multiple items or children are listed together, it indicates that their measure of ability or difficulty is the same or similar enough for plotting purposes. 'M' represents the mean item or child measures, with 'S' and 'T' indicating 1 and 2 standard deviations respectively. The means correspond with those in the summary statistics (Table 6-6) and visually

confirm that, on average, parents and teachers rate children as having higher levels of participation than the assessment captures.

The location of items along the scale on the Wright Map indicate that items from each section of the ACHIEVE Assessment are spread at various points along the hierarchy. In addition, items from ACHIEVE Assessment sections are targeted at a range of child difficulties. Items from the 'Organisation' subsection, conceptualised to capture process skills, generally rank as most difficult for parents and teachers to endorse a child with a high score. Environment items are easiest for parents and teachers to endorse. There are two small gaps between item ranking and some children have higher ability than all item difficulties, indicating a potential ceiling effect (Bond and Fox 2015). However, examination of individual item thresholds indicates that higher categories of the more difficult items are well targeted to the most able children.

Having checked the overall characteristics of the data and before planning any potential item, child or response removal, a full analysis of the data was carried out as overviewed in the following section.

**Figure 6-4 - Wright Map of items - full set**

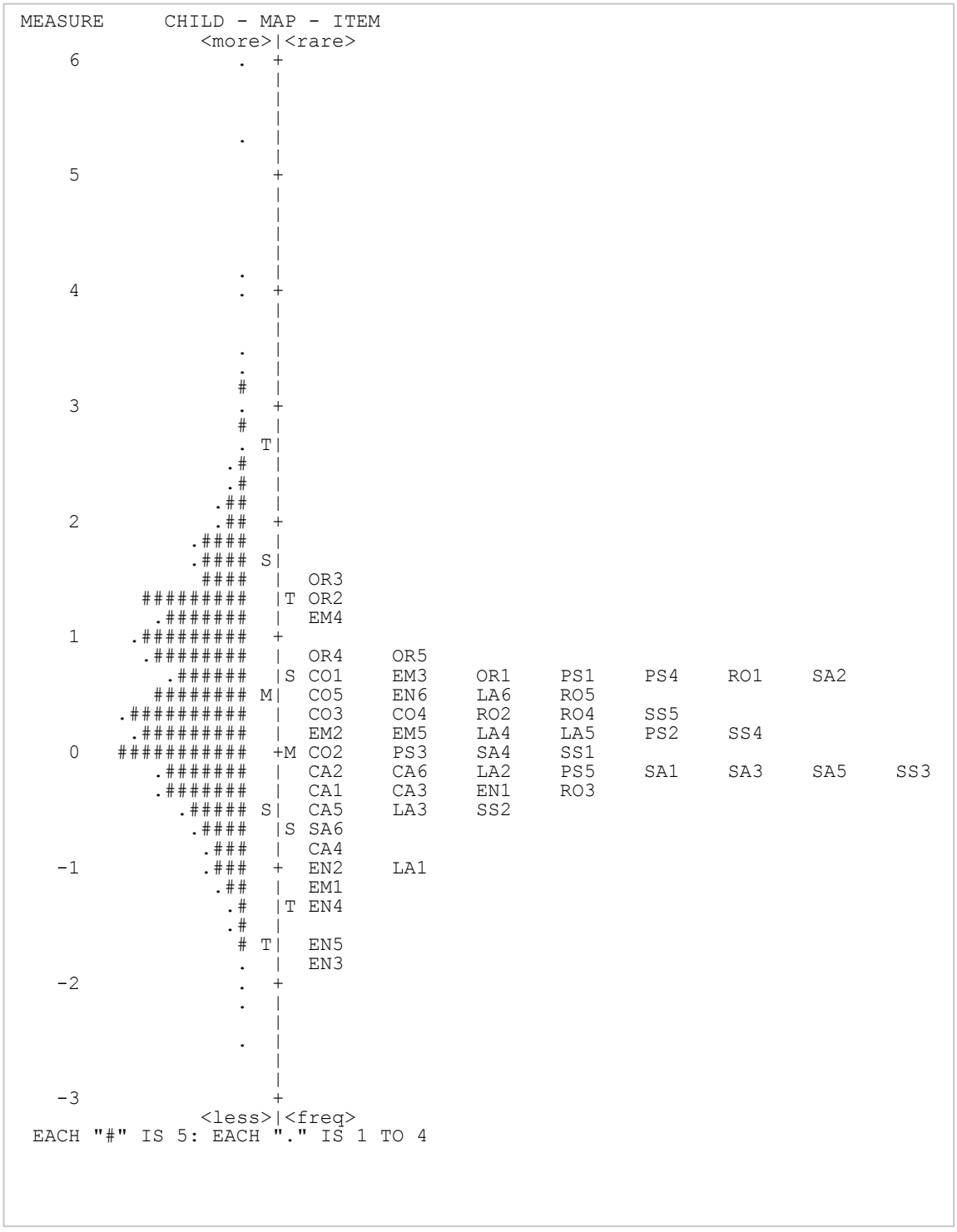
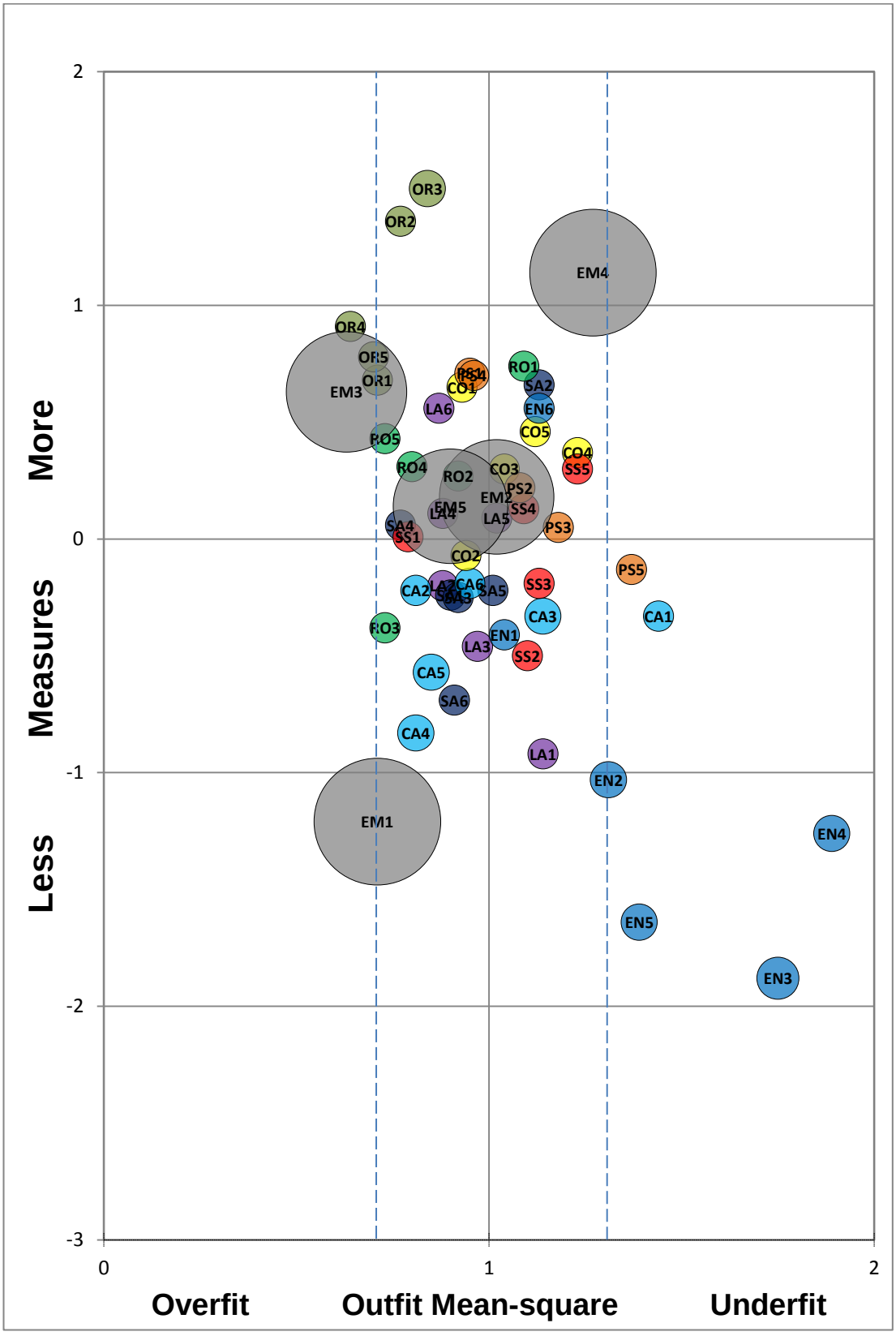


Figure 6-5 is an item pathway map, displaying the items according to their misfit. The size of the 'bubbles' represent the standard error of the items, the vertical placement relates to the item measures and the horizontal placement to the fit. Appendix I1 includes a table that also details the item fit statistics in entry order, corresponding to the pathway map; underfitting items are towards the top of the table and overfitting items at the bottom. The two vertical lines either side of the midline within the figure represent the fit parameters used for the study, 0.7 and 1.3 respectively, according to the recommendations from Wright and Linacre (1994). Reflective of the large sample size, item standard errors are generally small, indicating good precision of estimates. The standard errors for items EM1 – EM5 are larger than other items within the questionnaire. The larger standard errors reflect the lower responses to the 'Emotions and Sensations' items which only feature in the ADHD version of the questionnaire.

Items CA1 "Rides a bike, scooter, etc.", PS5 "Does not fatigue during activities", EN3 "Has access to things to help them take part", EN4 "Family members/staff are available to support" and EN5 "Nursery/school environment supports child to take part" show the most misfit and are all beyond the ranges set for the purposes of this analysis (OUTFIT MnSq > 1.3). Item EN2 "Your community/nursery/school environment has opportunities to support your child to do activities" additionally shows poorer fit to the Rasch model than other items.

**Figure 6-5 - Item pathway map**



In addition to misfit, items EN3 “Home/school environment provides access to things to help participation” EN4 “Family members/staff are available to support” and EN5 “Nursery/school environment supports child to participate” also exhibit noticeably lower point-measure correlations (0.27, 0.28 and 0.29 respectively), indicating potential additional dimensions that deviate from the latent trait (Linacre 2013). Item EN2 “Community/school environment has opportunities”, although not quite misfitting by the set criteria, also has a point-measure correlation (0.42) that is smaller than for any of the other items. Items EN3 and EN4 also exhibit disordered category averages, which may contribute to the misfit (Wu and Adams 2007). However, there are only 19 responses to category 1 of item EN4 and 7 responses to the same category 1 of item EN3. Low responses to categories increase the standard error and provide minimal information about the mean ability of children responding to these items, thus reducing the scope for interpretation of disordered category means contributing to the fit.

Initial examination of category function, summary statistics and fit statistics tables and graphs, indicates that items EN2-EN5 do not function in the same way as other items within the whole assessment, generally not fitting the probabilistic Rasch model. In addition to the problematic function of the items in respect to the child and item measures, the point-measure correlations of these items indicate that they are measuring a dimension that is separate to the assessment as a whole.

Consideration of the item content may provide some explanation of the misfit attributed to items EN2-EN4. These misfitting items pertain to the environment subsection of the ACHIEVE Assessment, indicating that this section generally performs differently to the others. Conceptually, this finding makes sense, as environmental characteristics do not equate to children’s participation, however its inclusion has implications for the overall measurement of the assessment (Bond and Fox 2015). Therefore, following a full initial investigation of all assessment categories and review of the item content as above, all of the environment items (items EN1-EN6) were treated separately to the remaining participation items. Although items EN1 and EN6 fit better than the other environment items with the overall model, removing these items allowed investigation of whether a separate environment

section would function better by itself and support better fit of the remaining items. This would ensure that the environment section still has sufficient items to be of use as a separate section (Linacre 2002). Section 6.5 details the results of this investigation.

The preceding section includes findings from an initial analysis of all items, with parent and teacher data sets combined. Overall, the findings indicate that parents and teachers use the categories on the rating scale in an ordered manner that is consistent with the expectations of the Rasch model. In addition to category function, the summary statistics indicate that there is sufficient information available to reliably calibrate and interpret Rasch item and child measures. Further, the ACHIEVE Assessment items appropriately target the range of child measures included in this study.

However, there is indication that parents and teachers endorse on average higher scores for children than items capture. Finally, the analysis of fit to the Rasch model indicates that the environment items on the ACHIEVE Assessment function differently to the participation items. This distinction between items detected by the Rasch model reflects conceptualisations of environment and participation. The following section overviews analysis of the environment items when separated from the full set of ACHIEVE Assessment items.

## 6.5 Environment Items Subsection

Ordinarily, misfitting items would result in their outright removal, however in this study the decision was taken instead to treat the misfitting items as a separate subsection. Following the decision to separate the environment items from the participation items, analysis of the new environment sub section (6 items) was undertaken to evaluate its measurement qualities. Doing so is an important step in the analysis process as, should the items demonstrate sufficient measurement qualities, they could prove a useful basis for future assessment of children's environments. The same process of analysis as followed for the full assessment was used for the environment sub section. In addition to fit analysis and checking summary statistics of the items, analysis of DIF and principle components analysis

(PCA) was carried out to support further in-depth examination. The following sections overview analysis of the environment items as a separate sub section. The items in this section are conceptualised as representing environmental supportiveness of participation.

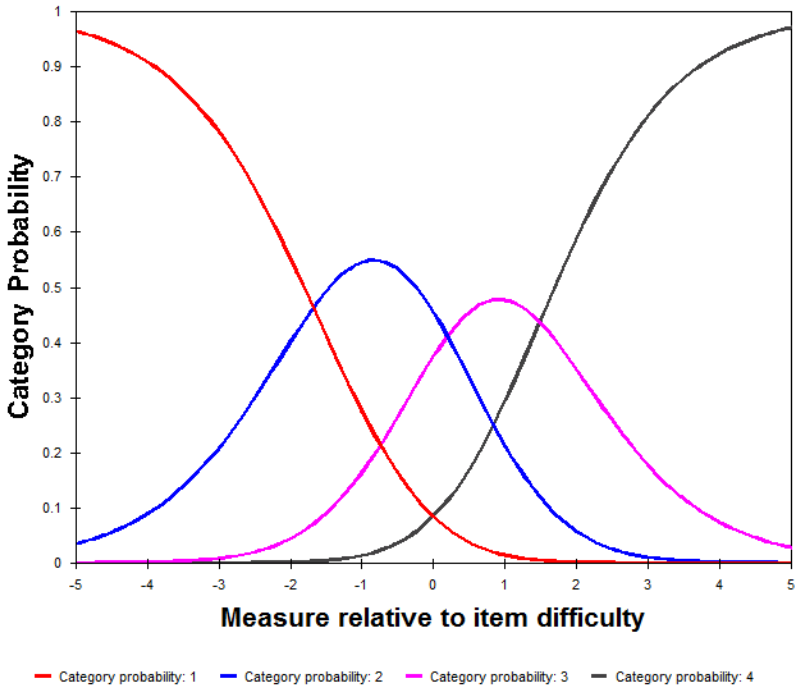
### 6.5.1 Category Function

The category probability graph (Figure 6-6) indicates that all categories are most probable relative to child ability over item difficulty at some point along the latent trait. Category 1 is the least observed and category 4 the most observed category, reflective of the ceiling effect seen on child-item targeting. Items EN3 and EN4 indicate disordering in the category ability mean between categories 1 and 2, however the low number of responses to category 1 for these items may cause the average to skew based on a small number of children with more extreme measures (Bond and Fox 2015).

**Table 6-7 - Category function - environment items**

| Category | Count | % | Category measure | Threshold | Average child measure |
|---|---|---|---|---|---|
| **1 "None of the time"** | 224 | 5 | ( -2.88) | NONE | -0.75 |
| **2 "Some of the time"** | 774 | 18 | -0.83 | -1.68 | 0.10 |
| **3 "Most of the time"** | 1223 | 29 | 0.91 | 0.20 | 1.21 |
| **4 "All of the time"** | 2042 | 48 | -2.75 | 1.48 | 2.46 |

**Figure 6-6 - Environment items category probabilities**




### 6.5.2 Summary Statistics and Targeting

Table 6-8 includes the summary statistics for children and items when analysing data for the environment items only. The environment items alone provide lower child reliability and higher item reliability in comparison with analysis of the full item set. The lower child reliability for this section reflects the smaller number of items, thus limiting the amount of information available to calibrate each child's measure (Linacre 1994, Bond and Fox 2015). The opposite effect is true for the increase in item reliability; including a smaller set of items whilst maintaining a large sample of children enhances the item calibration estimates. There are 65 extreme children for this sub section, all scoring the maximum measure, and no extreme items. The extreme children include a mix of parent and education reports, age groups, genders and reasons for referral.

The mean child measure is over 1 logit more than the mean item measure, indicating that it is relatively easy for parents or teachers to endorse environmental supportiveness (Bond and Fox 2015). Exclusion of the extreme children reduces the upper child measure by 1 logit. However, there is still indication of a ceiling effect

with respondents generally scoring the environment higher than the items are able to capture. This also reflects in the low child separation index, indicating that the sub section is not usefully distinguishing between different levels of supportiveness as is desirable for an assessment of this kind.

**Table 6-8 - Summary statistics - environment items**

| Summary of 671 non-extreme children | | | | |
|---|---|---|---|---|
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 18.10 | 5.80 | 1.37 | 0.69 |
| **P.SD** | 3.50 | 0.60 | 1.18 | 0.16 |
| **S.SD** | 3.50 | 0.60 | 1.18 | 0.16 |
| **MAX.** | 23.00 | 6.00 | 3.61 | 1.32 |
| **MIN.** | 3.00 | 1.00 | -1.72 | 0.55 |
| **Real** | **Separation** | 1.12 | **Reliability** | 0.55 |
| **Model** | **Separation** | 1.34 | **Reliability** | 0.64 |
| **S.E. of mean** | 0.05 | | | |
| **Summary of 736 extreme and non-extreme children** | | | | |
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 18.50 | 5.80 | 1.67 | 0.79 |
| **P.SD** | 3.70 | 0.60 | 1.49 | 0.37 |
| **S.SD** | 3.70 | 0.60 | 1.49 | 0.37 |
| **MAX.** | 24.00 | 6.00 | 4.94 | 1.89 |
| **MIN.** | 3.00 | 1.00 | -1.72 | 0.55 |
| **Real** | **Separation** | 1.25 | **Reliability** | 0.61 |
| **Model** | **Separation** | 1.39 | **Reliability** | 0.66 |
| **S.E. of mean** | 0.06 | | | |
| **Child raw score-to-measure correlation = 0.92** | | | | |
| **Summary of 54 non-extreme items** | | | | |
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 2268.20 | 710.5 | 0.00 | 0.07 |
| **P.SD** | 288.30 | 8.00 | 0.95 | 0.04 |
| **S.SD** | 315.80 | 8.80 | 1.05 | 0.04 |
| **MAX.** | 2563.00 | 725.00 | 1.77 | 0.21 |
| **MIN.** | 1700.00 | 700.00 | -1.08 | 0.05 |
| **Real** | **Separation** | 14.96 | **Reliability** | 1.00 |
| **Model** | **Separation** | 15.30 | **Reliability** | 1.00 |
| **S.E. of mean** | 0.43 | | | |

The presence of the extreme children within the analysis is affecting the standard error of the child measures, the child reliability and the mean child measure (Bond and Fox 2015). Therefore, for the purposes of further analysis within this study, extreme children were removed for analysis of the environment items. The following

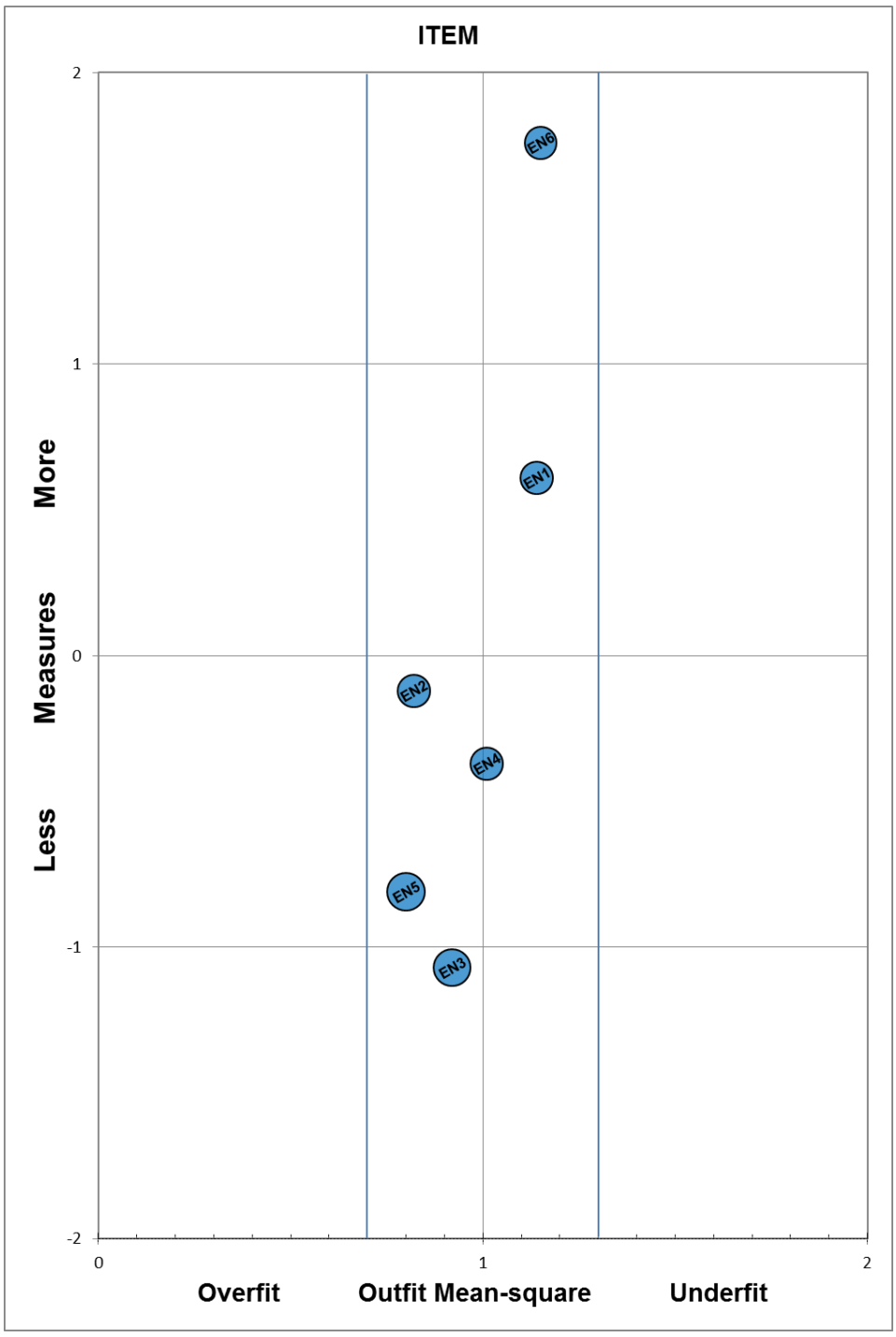
outputs and discussion therefore relate to the 6 environment items as completed in 671 questionnaires.

### 6.5.3 Item Fit

The item pathway map (Figure 6-7) for the environment sub section indicates that all items fit within the parameters set for this study (0.7-1.3 MnSq). The small 'bubble' size reflects the low standard error of these items' calibrations resulting from the large number of responses relative to items (Bond and Fox 2015). Overall, the items demonstrate a spread along the scale of approximately 3 logits, with 4 of the items calibrating at between 0 and -1 logits.

All items exhibit positive point-measure correlations >0.5. Despite the variation in fit statistics when these items were included in the full item set, all items now show favourable fit. The results therefore indicate that the items capture a single dimension for the purposes of measurement. Item maps indicate that there is a ceiling effect of children's measures higher than item measures.

**Figure 6-7 - Environment items pathway map**

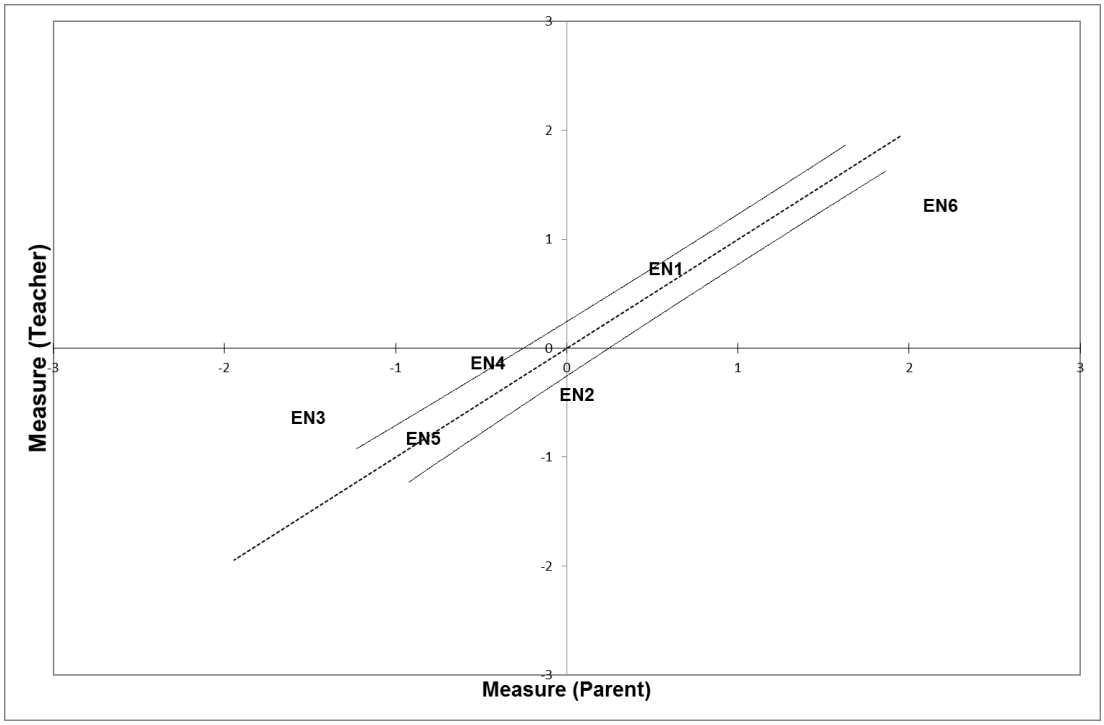


### 6.5.4 Variance between Parent and Teacher Item Function

Following initial analysis of the environment items, the next step was to analyse parent and education variance in order to determine the extent to which items differ in function between respondents.

Comparison between parent and education questionnaires using a cross plot (figure 6.8) indicates a slight shift in item measures, however the direction of difference varies between items. DIF statistics further confirm the differences seen in the cross plot figures. Current recommendations suggest that DIF with a contrast larger than 0.64 and t-value > 2.0 indicates significant and meaningful DIF (Wu and Adams 2007, Boone et al. 2014). Item EN3 and EN6 exhibit significant and meaningful DIF between parent and teacher calibrations.

**Figure 6-8 - Environment items – parent and education calibrations**




The above analyses indicate that the environment items generally fit the Rasch model better as a separate sub section. The categories function well and there is no difference as a function of gender. However, there is indication of difference in item measures as a function of respondent. Therefore, it is not appropriate to compare

scores on the environment items from the parent questionnaire with those on the teacher questionnaire. However, the sub section remains separately functional and thus, given the importance of the environment to children's participation, supports its ongoing inclusion in the ACHIEVE Assessment. The ease of endorsability of the environment items would benefit from further development efforts.

## 6.6 Analysis without Environment Items

Following separation of the environment items into a sub section, analysis of the remaining items as a full assessment was undertaken. The control file was edited to exclude the environment items from analysis. In total, there are 13.5% missing data points, however these are mostly contained within the 'emotions and sensations' section, included in only the ADHD version of the questionnaire. When these items are excluded, there are only 4.5% missing data points. Anchoring the analysis to calibrations based on the standard set of items ensures that the less precise estimates for the emotions and sensations items do not influence the function of the other items. The following sections detail analysis of category function (6.6.1), targeting (6.6.2), fit (6.6.3 and 6.6.5), parent and education item function (6.6.4), item hierarchy (6.6.6), DIF (6.6.7), additional dimensionality (6.6.8), and association between respondents (6.6.10).

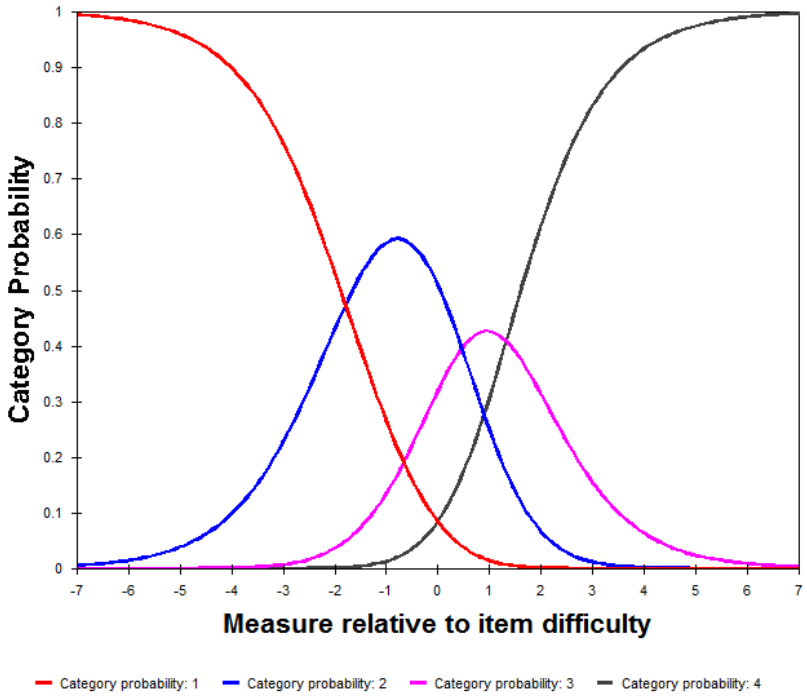
### 6.6.1 Category Function

Table 6-9 indicates that the categories increase in line with the mean child measures as expected. The graph in Figure 6-9 indicates that, with all participation items considered together, all categories are most probable at some point along the child measures relative to item measures. Category 1 is the least frequently observed of all the categories. Category 3 is the least probable overall in comparison with the other categories. However, parents' and teachers' use of the categories remains ordered. Therefore, the category function is suitable for further analysis and requires no alterations to the category structure.

**Table 6-9 - Category function - participation items**

| Category | Count | % | Category measure | Threshold | Average child measure |
|---|---|---|---|---|---|
| **1 "None of the time"** | 3306 | 11 | ( -2.96) | NONE | -1.04 |
| **2 "Some of the time"** | 10892 | 36 | -0.77 | -1.79 | -0.16 |
| **3 "Most of the time"** | 8987 | 30 | 0.96 | 0.47 | 0.67 |
| **4 "All of the time"** | 7237 | 24 | -2.66 | 1.32 | 1.60 |

**Figure 6-9 - Participation items category probabilities**




### 6.6.2 Summary Statistics and Targeting

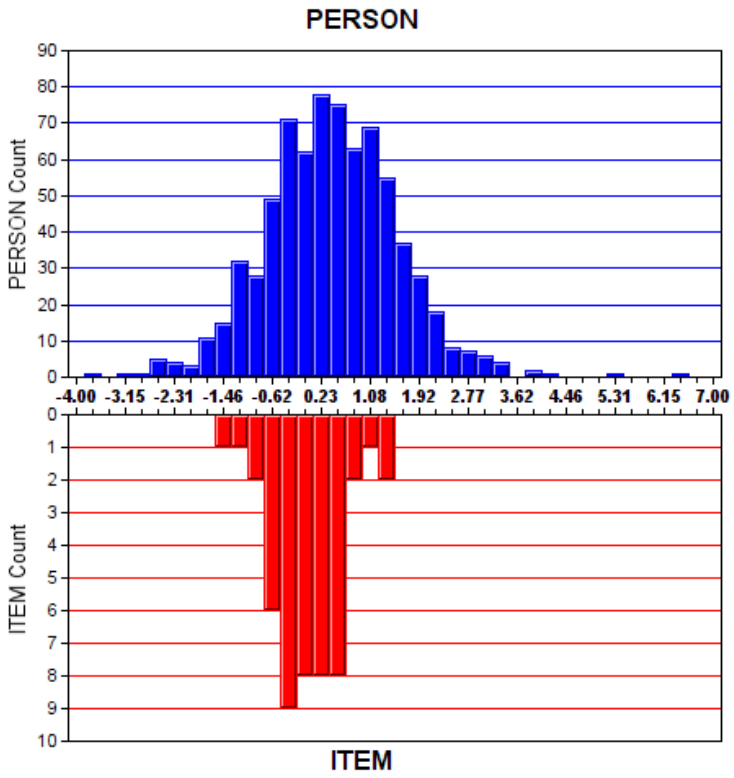
Table 6-10 displays the summary statistics for the data without the environment items. The child separation has reduced slightly, however still identifies at least 6 groups of child measure levels. The child reliability statistics for this set of items indicate strong item and child reliability according to recommended standards (Linacre 1994, Bond and Fox 2015). The mean child measure reduces slightly, bringing it closer to the item mean, thus indicating that removal of the environment items improves the overall targeting of item measures to children in the current study sample.

**Table 6-10 - Summary statistics - participation items**

| Summary of 735 non-extreme children | | | | |
|---|---|---|---|---|
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 110.20 | 41.40 | 0.40 | 0.22 |
| **P.SD** | 26.40 | 3.80 | 1.14 | 0.05 |
| **S.SD** | 26.40 | 3.80 | 1.14 | 0.05 |
| **MAX.** | 171.00 | 48.00 | 5.24 | 1.00 |
| **MIN.** | 32.00 | 12.00 | -3.80 | 0.19 |
| **Real** | **Separation** | 4.46 | **Reliability** | 0.95 |
| **Model** | **Separation** | 4.83 | **Reliability** | 0.96 |
| **S.E. of mean** | 0.04 | | | |
| **Summary of 736 extreme and non-extreme children** | | | | |
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 110.30 | 41.40 | 0.41 | 0.23 |
| **P.SD** | 26.50 | 3.80 | 1.16 | 0.08 |
| **S.SD** | 26.50 | 3.80 | 1.16 | 0.08 |
| **MAX.** | 172.00 | 48.00 | 6.45 | 1.83 |
| **MIN.** | 32.00 | 12.00 | -3.80 | 0.19 |
| **Real** | **Separation** | 4.38 | **Reliability** | 0.95 |
| **Model** | **Separation** | 4.72 | **Reliability** | 0.96 |
| **S.E. of mean** | 0.04 | | | |
| **Child raw score-to-measure correlation = 0.92** | | | | |
| **Summary of 54 non-extreme items** | | | | |
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 1691.10 | 634.70 | 0.00 | 0.07 |
| **P.SD** | 565.00 | 202.10 | 0.59 | 0.05 |
| **S.SD** | 570.90 | 204.20 | 0.60 | 0.05 |
| **MAX.** | 2315.00 | 726.00 | 1.43 | 0.22 |
| **MIN.** | 93.00 | 46.00 | -1.41 | 0.05 |
| **Real** | **Separation** | 6.78 | **Reliability** | 0.98 |
| **Model** | **Separation** | 7.04 | **Reliability** | 0.98 |
| **S.E. of mean** | 0.09 | | | |

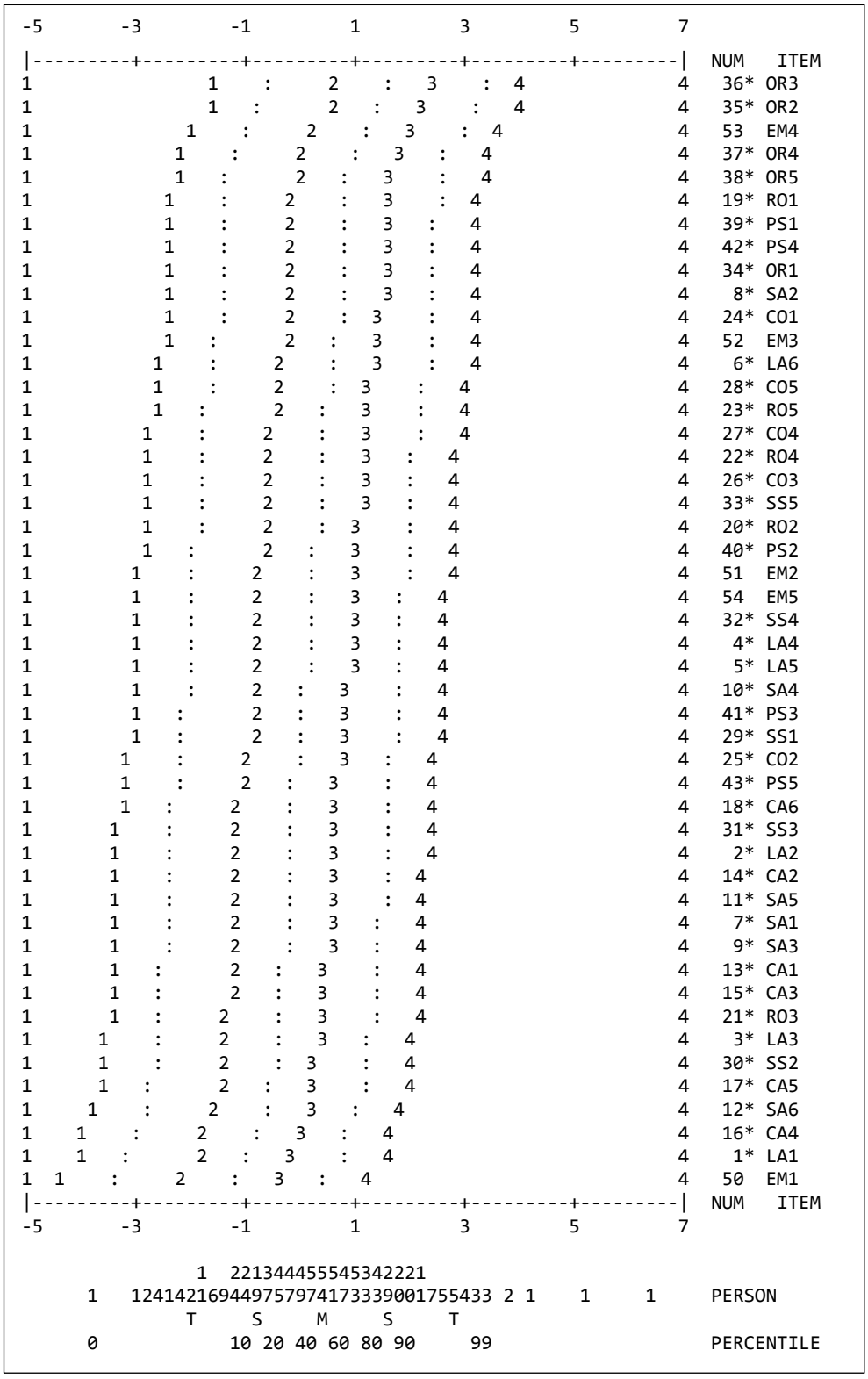
The child-item histogram (Figure 6-10) for these items indicates that child measures are spread across a wider range along the logit scale than items. This indicates that children with higher or lower levels of the latent trait, participation, may not be appropriately targeted by the ACHIEVE Assessment items and thus insufficient information available to distinguish between children at those levels (Bond and Fox 2015).

**Figure 6-10 - Child-item histogram - participation items**




However, examination of the Andrich thresholds in the construct keymap (Figure 6-11) indicates that there are categories appropriately targeted to 99% of children in the sample. Therefore, the upper category scores appropriately target children with higher measures. At this stage, no changes to the items were necessary.

**Figure 6-11 - Construct keymap - participation items**



### 6.6.3 Fit Analysis

Further to the child-item histograms, the item pathway map (Figure 6-12) provides information about the location of specific items along the latent trait. In addition to the location of items according to difficulty (y-axis), the pathway map indicates the size of each item's standard error and its fit according to outfit Mean-Square statistics (x-axis). The two blue lines on the plot area indicate the 0.7 and 1.3 parameters used for identification of fit to the Rasch model. Initial examination of the item pathway map shows that a majority of the items (42/48) lie within the fit parameters. Of those lying outside or close to outside the parameters, three underfit and three overfit.

The items with the higher standard errors belong to the Emotions and Sensations subsection of the ACHIEVE Assessment which is contained only in the 'ADHD' version of the questionnaire. The smaller return of ADHD questionnaires, in comparison with the standard version, therefore reduces precision of the calibrations for this section of items and thus increases the standard error (Linacre 2013).

Underfitting items are a more significant threat to the data than overfitting items due to the creation of extra 'noise' in the data (Linacre 2002, Bond and Fox 2015). Therefore, the following paragraphs overview investigation into the two most underfitting items that are beyond the fit parameters, items CA1 "Rides a bike, scooter, etc." and PS5 "Does not fatigue during activities". In particular, this investigation explores potential causes of the misfit, whether this arises as a function of subgroups within the sample or differences between parent and teacher responses, and thus whether the item can be treated differently to remedy the misfit or is best 'fixed' by removal.

Item CA1 utilises different wording for parent and teacher reports, which may be a contributory factor of misfit. Although the parent question focuses on the physical performance of riding a scooter, bike etc., the education question focuses on engaging with friends and peers through such activities. The different focus between the wordings of each item may result in misfitting response patterns.

Unexpected responses to items can cause misfit (Linacre 2013). Therefore, in order to investigate the cause of misfit for CA1, unexpected responses were identified using a criteria of standardised residuals >2. Details of parent and education reports exhibiting unexpected responses were compared. Frequencies of age and gender show similar proportions between the full sample and those with unexpected responses to CA1. However, while there is a 54.5%/45.5% split between parent and education respondents for the full set, a total 89.8% of unexpected responses to item CA1 were from parents. Removal of unexpected responses to item CA1 therefore improves the overall fit statistics of the item. Figure 6-13 is a pathway map that demonstrates the impact of removing unexpected responses to item CA1.

Examination of item PS5 indicates 59 unexpected responses, 8.5% of the total responses to that item, with some overlapping with those children with unexpected responses for item CA1. Unlike the responses to CA1, there are similar proportions between the full sample and those with unexpected responses to PS5. Examination of the Item Characteristic Curve (ICC) and category probability curves indicates problems when respondents rate children with lower ability. However, the fewer endorsements of category 1 in comparison to the other categories may result in less precise calibrations when child ability is relatively lower than item difficulty. As it is the only item misfitting after removal of the unexpected parent responses to item CA1, the decision was taken to proceed with the analysis with this item still included and no further adjustments made.

**Figure 6-12 - Item pathway map - participation items**

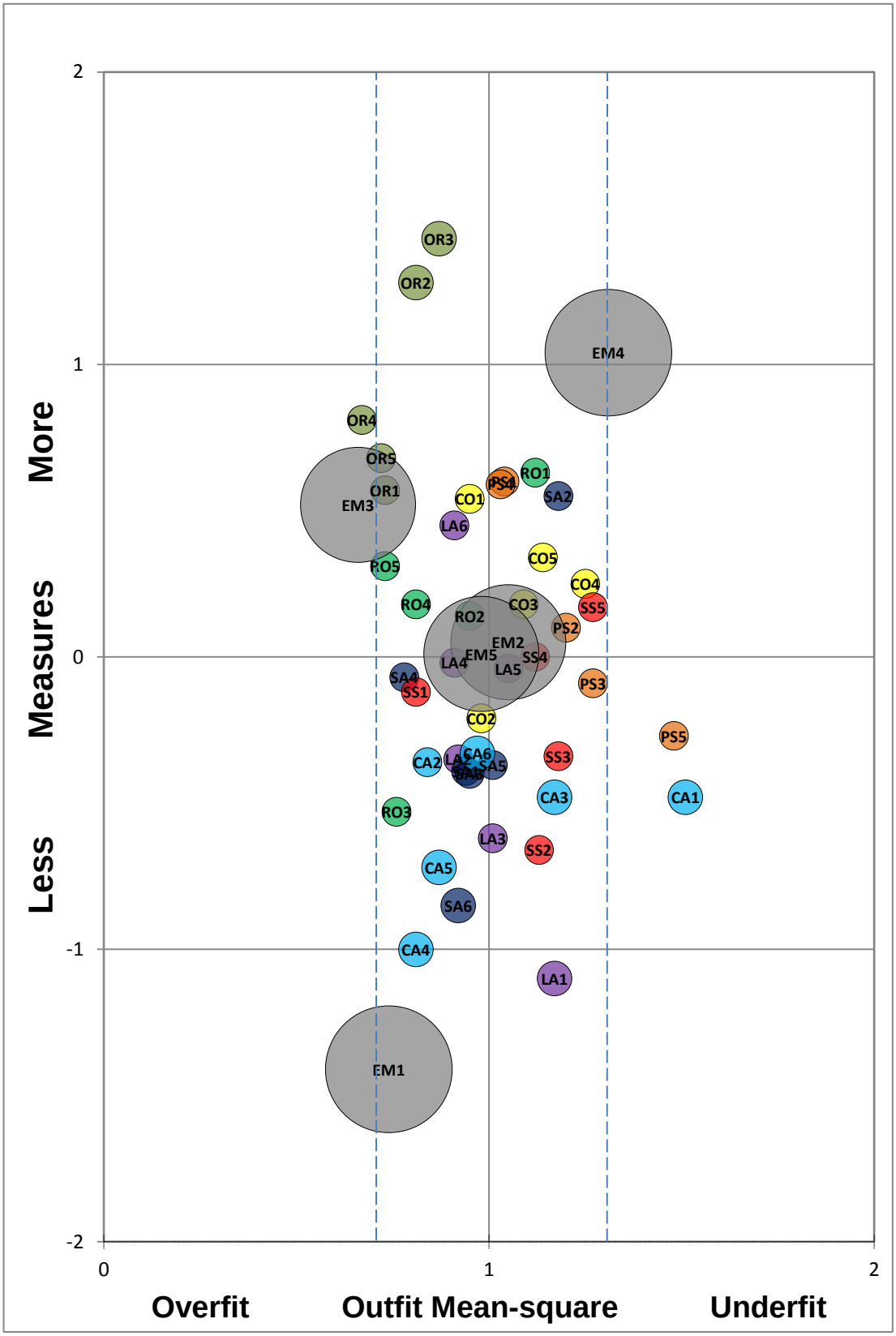
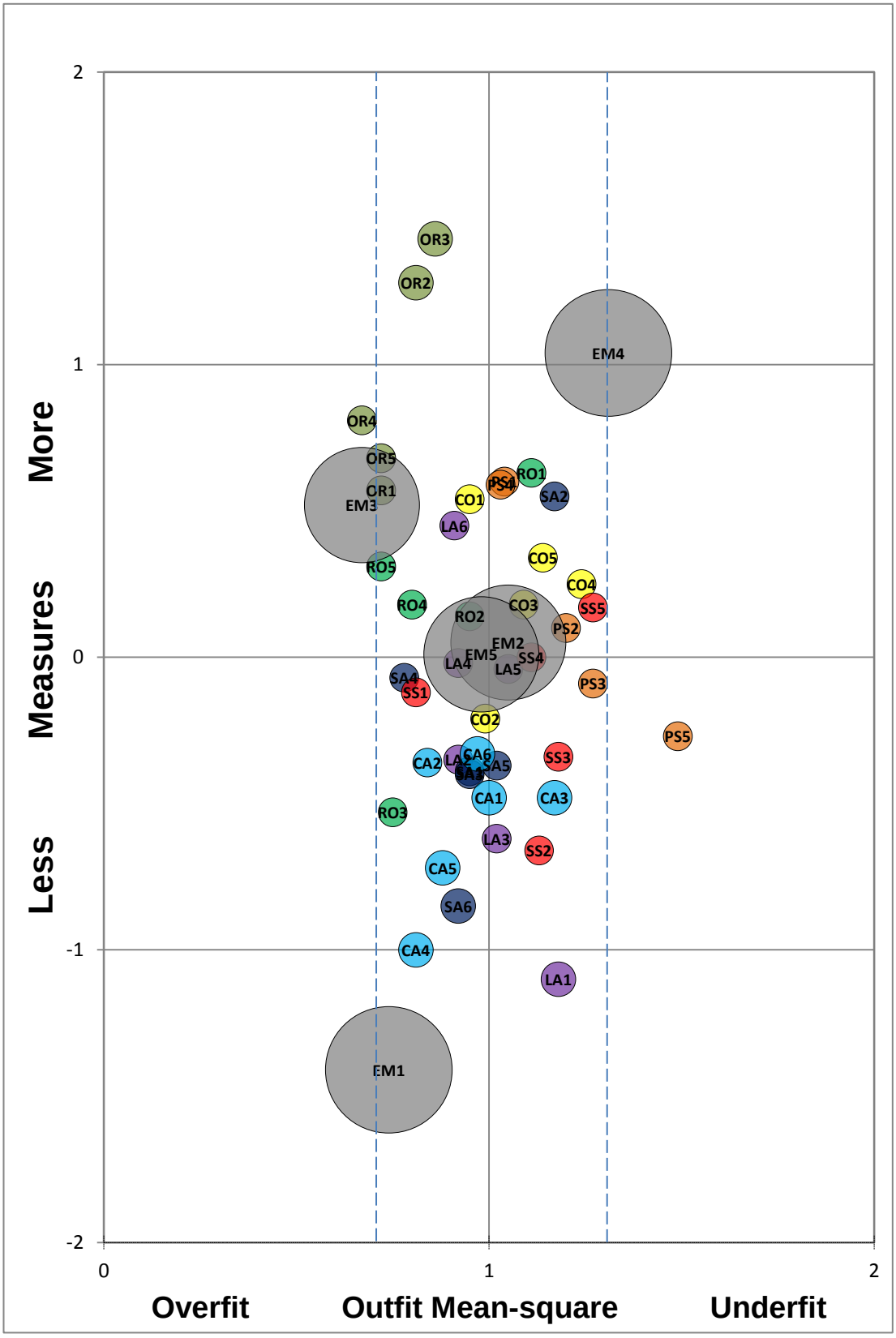


**Figure 6-13 - Pathway map - after removal of unexpected responses**



Having developed an understanding of the overall function of the ACHIEVE Assessment, and in line with the processes followed for the environment sub section, the next step in analysis was to compare item and child calibrations as specific to parent and education data sets.

**Figure 6-14 - Respondent DIF - size**

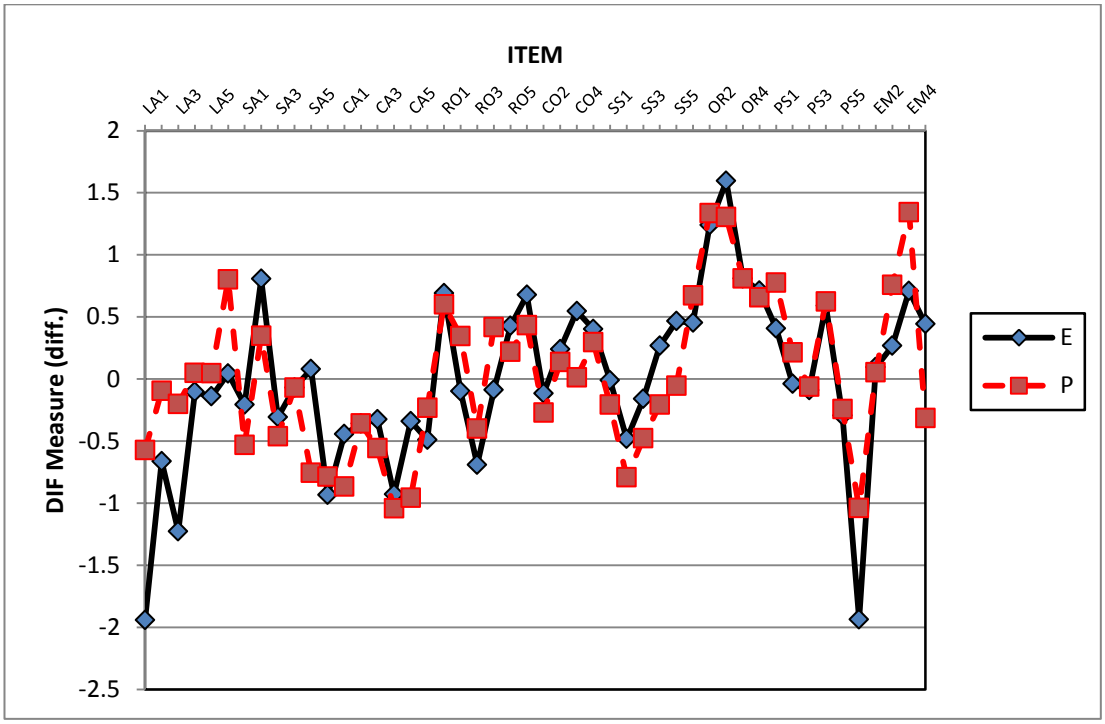



Figure 6-14 is a plot of DIF size as a function of respondent generated using the full data set of responses and Figure 6-15 is the corresponding plot of DIF t-value. DIF size greater than 0.64 with t-value greater than 2.0 is considered potentially problematic and requiring further investigation (Wu and Adams 2007, Boone et al. 2014). However, due to the matching of samples in this analysis, the decision was taken to use the stricter parameter of 0.5 to interpret DIF between respondents. There are several instances of DIF, which indicate significant differences between the parent and education ratings of these items, further explored in the following sections. DIF analysis indicates differential function between respondents for items LA1, LA2, LA3, LA6, SA5, CA5, RO4, CO4, SS4 and SS5.

**Figure 6-15 - DIF Plot - t-value**

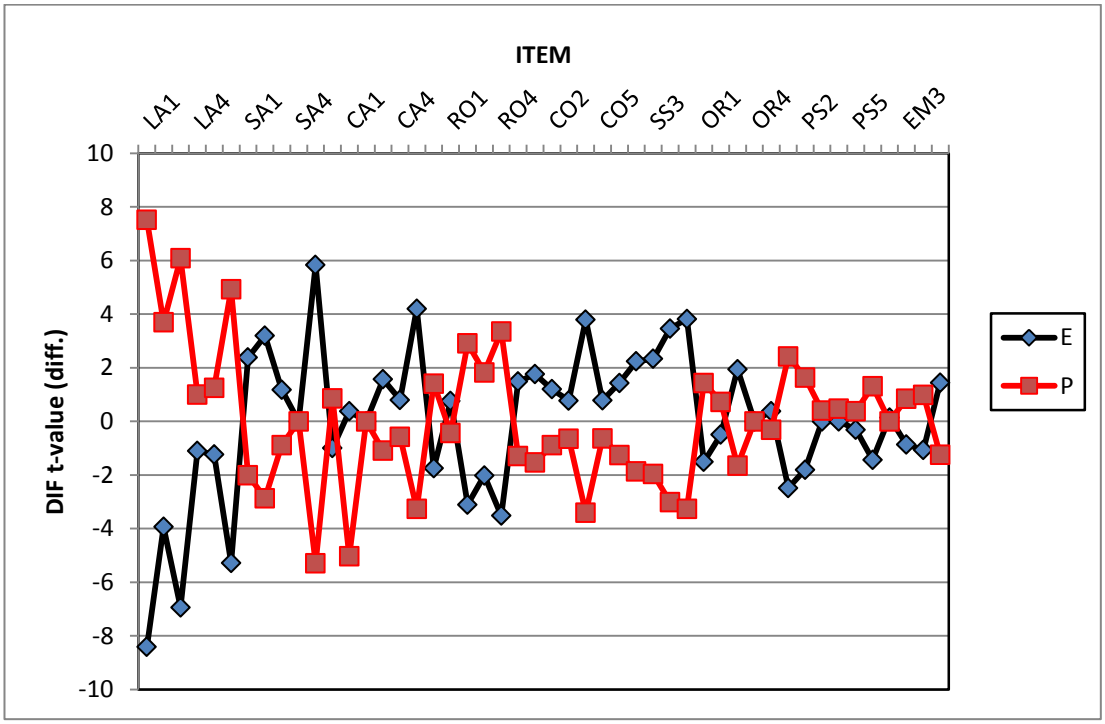
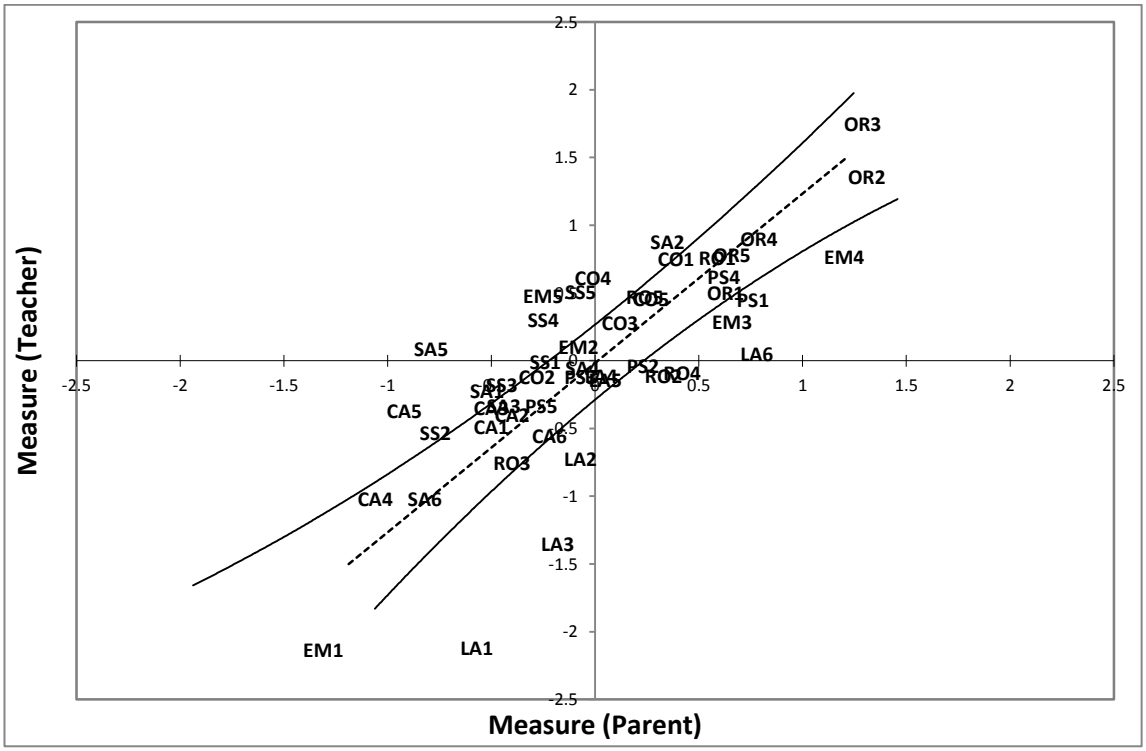



Figure 6-16 is a cross plot of item measures, including only those children for who parent and teacher questionnaires are available. The comparison uses separate files for each respondent, structured to support matching children from one to the other. Following from the analysis of the full data set, the unexpected responses to item CA1 are not included in this investigation. The dotted line indicates the empirical line and the two, slightly curved lines mark the 95% confidence intervals. In total, 66 items lie beyond the confidence intervals, indicating that their measure calibrations differ significantly between parent and education data sets. Due to their large standard errors, although Emotions and Sensations section items (EM1-EM5) lie beyond the confidence intervals, they do not have significant t-values (>2) indicating difference.

**Figure 6-16 - Cross plot of parent and education item measures**




The DIF analysis and cross plot therefore indicate that 10 of the 48 items differ in function between parent and teacher versions. Examination of the item content highlights that the wording for item SA5 differs between parent and teachers (Parent – "Cleans self after toilet", Teacher - "Organises self to manage routines") to avoid there being two items on the teacher questionnaire relating to children's toilet use at school, already captured in LA1. However, for the other variant items, the wording and participation focus is essentially the same; indicating that there is a genuine difference in the way that parents and teachers use the variant items. Therefore, comparing children's participation scores using these items may not be appropriate. Bond and Fox (2015) highlight the importance of addressing such variance and suggest following a procedure of common item linking.

Wolfe and Chiu (1999) report a procedure to follow that supports further investigation of variance. Wolfe and Chiu (1999) designed the original procedure in order to investigate pre-test and post-test changes; however, it has been adapted to allow variance investigations between respondents in the present study. There is no example of such a procedure to respondent variance followed within existing research

literature, thus adopting such a strategy to cross-respondent comparison is novel. In order to minimise the impact of extremely underfitting children, those children with an outfit MnSq >2.0 on either set were removed from both to aid further comparison.

Wolfe and Chiu (1999) further advise checking the variance between the category calibrations between children. Using a t-test can establish whether differences between category 'steps' on two separate iterations differ significantly when their standard errors are taken into account. Z values > 2.00 are statistically significantly different. For category step 1 -> 2, the Z-value is 6.13, for step 2 -> 3 the Z-value is 2.12 and for 3 -> 4 the Z value is -11.31. Therefore, the step calibrations vary significantly differently between parents and teachers. Therefore, to create a common frame of reference for further investigation using the underlying rating scale, the rating scale calibrations from the full set were anchored to both to create corrected calibrations. Generating rating scale steps using the full data set produces calibrations that are consistent across item function and child measure on both occasions.

Using the corrected rating scale calibrations, the analysis was run again to produce updated item measures for both these respondents. Again, t-test analysis was used to determine those items that differed significantly between respondents. Using Z-values greater than 2 with a difference >0.5, the items identified as differing significantly were: LA1-LA3, LA6, SA2, SA5, CA5, RO4, CO4, SS4, and SS5.

Following anchoring of the rating scale thresholds, the next stage in analysis is to estimate corrected estimates for the child and item calibrations for both respondents. First, the parent item calibrations were generated using the corrected rating scale calibrations. In order to measure the difference between parent and education calibrations, the item measures from this step are then used as anchor values for the education data set. Only the items that show no variance between respondents are anchored to the correct calibrations. However, the 11 items that were shown to be variant during the first step are not anchored and are instead allowed to 'float', their calibration can change.

The resultant child measures using the corrected education item calibrations are then anchored in another analysis, with the item measures allowed to 'float'. The result is a

set of item calibrations that are corrected for changes in perception between teacher and parent, in addition to use of rating scales. The resulting values can therefore be taken as true differences in parent and teacher item function. The t-test calculations indicate that 10 of the 48 items function differently between parent and education responses (LA1-LA3, LA6, SA5, CA5, RO4, CO4, SS4, and SS5). The variant items are therefore equivalent to the initial analysis, indicating that the remaining 38 items maintain invariance.

**Table 6-11 - Respondent variance summary**

| Code | Item content (shortened) | DIF | Cross plot | Z-test | Corrected Z-test |
|---|---|---|---|---|---|
| **LA1** | Cleans self after toilet | Y | Y | Y | Y |
| **LA2** | Manages clothing | Y | Y | Y | Y |
| **LA3** | Manages snacks/lunch | Y | Y | Y | Y |
| **LA4** | Cleans up after activity | | | | |
| **LA5** | Prepares self for school | | | | |
| **LA6** | Effectively moves between activities | Y | Y | Y | Y |
| **SA1** | Effectively uses learning materials | | | | |
| **SA2** | Handwriting and shape making | | Y | Y | |
| **SA3** | Engages in sport activities | | | | |
| **SA4** | Engages in curriculum activities | | | | |
| **SA5** | Organises self/Cleans self after toilet | Y | Y | Y | Y |
| **SA6** | Dresses self after P.E. | | | | |
| **CA1** | Rides a bike, scooter etc. | | | | |
| **CA2** | Plays in organised group activities | | | | |
| **CA3** | Participates in out of school clubs | | | | |
| **CA4** | Participates in social events | | | | |
| **CA5** | Participates in leisure activities | Y | Y | Y | Y |
| **CA6** | Manages clothes after leisure activities | | | | |
| **RO1** | Organises routines | | | | |
| **RO2** | Copes with changed routines | | Y | | |
| **RO3** | Copes with variety of activities | | | | |
| **RO4** | Understands responsibilities | Y | Y | Y | Y |
| **RO5** | Manages multiple responsibilities | | | | |
| **CO1** | Confident in abilities | | | | |
| **CO2** | Enjoys daily activities | | | | |
| **CO3** | Satisfied with activity performance | | | | |
| **CO4** | Tells what wants to get better at | Y | Y | Y | Y |
| **CO5** | Keeps trying despite challenges | | | | |
| **SS1** | Plays/interacts well with others | | | | |
| **SS2** | Chatty/sociable and talks with friends | | | | |
| **SS3** | Speaks clearly with others | | | | |
| **SS4** | Understands others' feelings | | Y | Y | Y |

| Code | Item content (shortened) | DIF | Cross plot | Z-test | Corrected Z-test |
|---|---|---|---|---|---|
| **SS5** | Asks for support needed | Y | Y | Y | Y |
| **OR1** | Organises and uses objects | | | | |
| **OR2** | Maintains concentration | | | | |
| **OR3** | Works out problems if stuck | | | | |
| **OR4** | Follows through instructions | | | | |
| **OR5** | Completes activity steps in right order | | | | |
| **PS1** | Is not clumsy during activities | | | | |
| **PS2** | Does not lose balance during activities | | | | |
| **PS3** | Grips objects effectively during activities | | | | |
| **PS4** | Has adequate physical dexterity | | | | |
| **PS5** | Does not fatigue during activities | | | | |

Table 6-11 summarises the findings from the DIF, cross plot, initial z-test and corrected z-test analyses. Following corrections of the item and child measure calibrations as above, child measures as calculated across parent and education responses were compared to investigate differences between the ways these two respondents report children's participation. Section 6.6.10 reports the findings of this analysis.

### 6.6.5 Final Fit Analysis

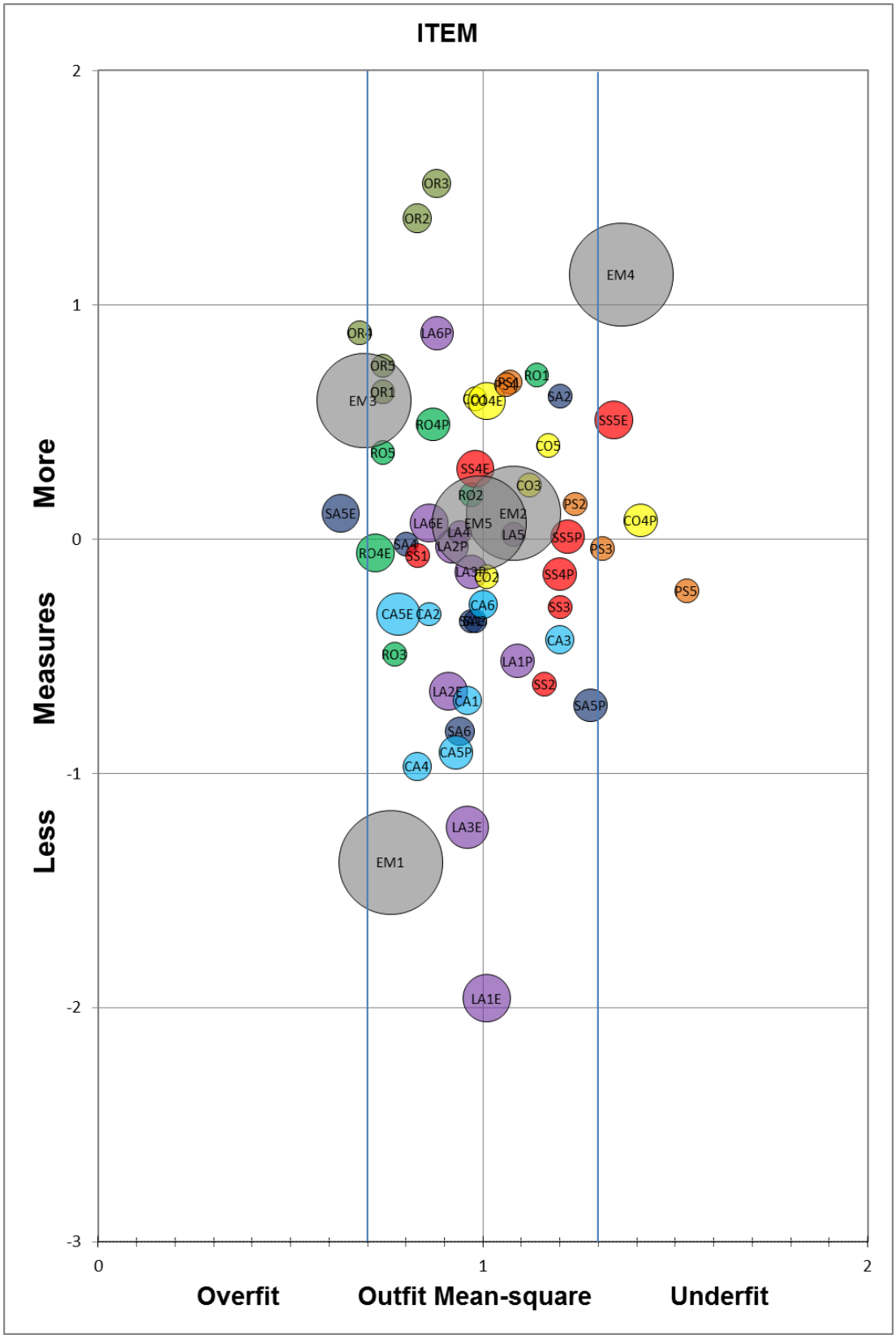
Following identification of the variant items, it is appropriate to return to a combined data set of items for a final analysis of item fit (Linacre 2016b). For this analysis, the items identified as variant are each treated as two separate items according to respondent. The data set was prepared so that each of the variant items was listed as separate versions, with only parent or teacher responses as appropriate. Thus, the final data set contains 63 items. However, as environment items were previously shown to measure as a different construct, they are excluded from the analysis, leaving 57 items. Table 6-12 includes the summary statistics for the full data set and Figure 6-17 is the corresponding pathway map. The summary statistics reflect the combined data set. The item reliability and small standard errors displayed on the graph indicate that the combined set and, thus, increased sample of children provides sufficient information for confidence in the item calibrations.

**Table 6-12 - Summary statistics - final analysis**

| Summary of 735 non-extreme children | | | | |
|---|---|---|---|---|
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 110.1 | 41.3 | 0.46 | 0.23 |
| **P.SD** | 26.4 | 3.8 | 1.17 | 0.05 |
| **S.SD** | 26.4 | 3.8 | 1.17 | 0.05 |
| **MAX.** | 171 | 48 | 5.37 | 1.00 |
| **MIN.** | 32 | 12 | -3.88 | 0.19 |
| **Real** | **Separation** | 4.53 | **Reliability** | 0.95 |
| **Model** | **Separation** | 4.91 | **Reliability** | 0.96 |
| **S.E. of mean** | 0.04 | | | |
| **Summary of 736 extreme and non-extreme children** | | | | |
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 110.1 | 41.3 | 0.47 | 0.23 |
| **P.SD** | 26.5 | 3.8 | 1.19 | 0.08 |
| **S.SD** | 26.5 | 3.8 | 1.19 | 0.08 |
| **MAX.** | 172 | 48 | 6.58 | 1.83 |
| **MIN.** | 32 | 12 | -3.88 | 0.19 |
| **Real** | **Separation** | 4.45 | **Reliability** | 0.95 |
| **Model** | **Separation** | 4.80 | **Reliability** | 0.96 |
| **S.E. of mean** | 0.04 | | | |
| **Child raw score-to-measure correlation =0 .92** | | | | |
| **Summary of non-extreme items** | | | | |
| | **Total score** | **Count** | **Measure** | **Model S.E.** |
| **MEAN** | 1397.6 | 524.2 | 0.01 | 0.08 |
| **P.SD** | 584.0 | 219.9 | 0.65 | 0.04 |
| **S.SD** | 589.1 | 221.8 | 0.66 | 0.04 |
| **MAX.** | 2169 | 726 | 1.52 | 0.22 |
| **MIN.** | 93 | 46 | -1.96 | 0.05 |
| **Real** | **Separation** | 7.19 | **Reliability** | 0.98 |
| **Model** | **Separation** | 7.48 | **Reliability** | 0.98 |
| **S.E. of mean** | 0.09 | | | |

Examination of the item pathway map indicates that the majority of items fit the requirements of the Rasch model (within 0.7 and 1.3 outfit MnSq). One item common to parent and education versions shows as most misfitting. In addition, one parent-specific and one education-specific item overfit, however with a lower MnSq value than the common item. Finally, item PS3 also demonstrates marginal misfit. The content of each of the four items showing as misfitting is pertinent to gathering a comprehensive picture of children's participation and useful in identifying potential restrictive barriers. In addition, as there is only one common and two specific items that misfit, the total combined influence is minimal.

**Figure 6-17 - Final pathway map**



### 6.6.6 Item Hierarchy

Table 6-13 includes the items in order of descending Rasch measure. Those items at the top of the table represent activities that are most demanding for children to participate. The items from the 'organisation' section of the ACHIEVE Assessment, relating to children's process skills, are all among the hardest 10 items. The other hardest items relate to children's motor skills (N=2), organising routines (N=1), moving between activities (N=1) and sensitivity to sensations (N=1). Of the 10 easiest items, 5 relate to self-care at school, 4 relate to leisure activities or social engagement and 1 relates to their response to being separated from parents.

Items from the Organisation (process skills), Physical Skills and Social Skills sections of the ACHIEVE Assessment exhibit overlap in their position along the Rasch measure. However, organisation items tend to lie at the upper end of the hierarchy, Social Skills items at the middle and lower ends, and Physical Skills within the middle section. The average measure for Organisation items is 1.02 (S.E. 0.17) which is significantly more than the average for Physical Skills (measure=0.23, S.E. 0.18) and Social Skills (measure=0.06, S.E. 0.14). There is no significant difference between the Physical Skills and Social Skills sections. Items relating to children's confidence also tend to be in the harder half of the item hierarchy, apart from CO2 "Enjoys daily activities", that is within the easier half.

For items with parent and teacher specific versions, teacher-specific items relating to children's self-care (LA1E "Cleans self after toilet", LA2E "Manages clothing at" and LA3E "Manages snacks/lunch"), understanding responsibilities (RO4E) and effectively moving between activities (LA6E) at school all have lower Rasch measures than the equivalent parent/home versions. Conversely, parent-specific versions of items relating to children's engagement in leisure activities with others (CA5P), understanding others' feelings (SS4P), asking for support (SS5P) and telling what they want to get better at (CO4P) are more easily endorsed than the corresponding teacher versions.

**Table 6-13 - Item hierarchy in order of descending difficulty**

| Code | Content | Measure |
|---|---|---|
| **OR3** | Works out problems if stuck | 1.52 |
| **OR2** | Maintains concentration | 1.37 |
| **EM4** | Appropriately sensitive | 1.13 |
| **LA6P** | Effectively moves between home activities | 0.88 |
| **OR4** | Follows through instructions | 0.88 |
| **OR5** | Completes activity steps in right order | 0.74 |
| **RO1** | Organises routines | 0.70 |
| **PS1** | Is not clumsy during activities | 0.67 |
| **PS4** | Has adequate physical dexterity | 0.66 |
| **OR1** | Organises and uses objects for activities | 0.63 |
| **SA2** | Handwriting and shape making | 0.61 |
| **CO1** | Confident in abilities | 0.60 |
| **CO4E** | Tells teachers what wants to get better at | 0.59 |
| **EM3** | Undaunted by new experiences | 0.59 |
| **SS5E** | Asks for support needed at school | 0.51 |
| **RO4P** | Understands responsibilities at home | 0.49 |
| **CO5** | Keeps trying despite challenges | 0.40 |
| **RO5** | Manages multiple responsibilities | 0.37 |
| **SS4E** | Understands others' feelings at school | 0.30 |
| **CO3** | Satisfied with activity performance | 0.23 |
| **RO2** | Copes with changed routines | 0.19 |
| **PS2** | Does not lose balance during activities | 0.15 |
| **SA5E** | Organises self to manage routines | 0.11 |
| **EM2** | Confident and self-assured | 0.11 |
| **CO4P** | Tells parents what wants to get better at | 0.08 |
| **LA6E** | Effectively moves between school activities | 0.07 |
| **EM5** | Appropriate level of alertness | 0.07 |
| **LA4** | Cleans up after activity | 0.03 |
| **LA5** | Prepares self for school | 0.02 |
| **SS5P** | Asks for support needed at home | 0.01 |
| **SA4** | Engages in curriculum activities | -0.02 |
| **LA2P** | Manages clothing at home | -0.03 |
| **PS3** | Grips objects effectively during activities | -0.04 |
| **RO4E** | Understands responsibilities at school | -0.06 |
| **SS1** | Plays/interacts well with others | -0.07 |
| **LA3P** | Manages snacks/lunch at home | -0.14 |
| **SS4P** | Understands others' feelings at home | -0.15 |
| **CO2** | Enjoys daily activities | -0.16 |
| **PS5** | Does not fatigue during activities | -0.22 |
| **CA6** | Manages clothes after leisure activities | -0.28 |
| **SS3** | Speaks clearly with others | -0.29 |
| **CA2** | Plays in organised group activities | -0.32 |
| **CA5E** | Participates in leisure activities with classmates | -0.32 |

| Code | Content | Measure |
|---|---|---|
| **SA1** | Effectively uses learning materials | -0.35 |
| **SA3** | Engages in sports activities | -0.35 |
| **CA3** | Participates in out of school clubs | -0.43 |
| **RO3** | Copes with variety of activities | -0.49 |
| **LA1P** | Cleans self after toilet at home | -0.52 |
| **SS2** | Chatty/sociable and talks with friends | -0.62 |
| **LA2E** | Manages clothing at school | -0.65 |
| **CA1** | Rides a bike, scooter, etc. | -0.69 |
| **SA5P** | Cleans self after toilet | -0.71 |
| **SA6** | Dresses self after P.E | -0.82 |
| **CA5P** | Participates in leisure activities with family | -0.91 |
| **CA4** | Participates in social events | -0.97 |
| **LA3E** | Manages snacks/lunch at school | -1.23 |
| **EM1** | Calm and happy to be separated | -1.38 |
| **LA1E** | Cleans self after toilet at school | -1.96 |

### 6.6.7 Differential Item Functioning

In addition to identifying items that are invariant across parent and education versions of the ACHIEVE Assessment, ensuring that items maintain consistent function across groups of children is important in protecting against item bias (Wu and Adams 2007, Boone et al. 2014). Knowing whether item function varies between specific groups of children will support use of the ACHIEVE Assessment for comparative research. For example, existing research includes studies comparing participation of boys and girls, or investigating the association between age and participation (e.g. Bult et al. 2013, King et al. 2013b). Common examples of item bias include items that are easier for one gender than another (Boone et al. 2014). In this sense, the item function and hierarchy differs across groups; thus scoring is not equivalent and may inflate the participation measures of one group or another.

Linacre (2013) recommends a minimum of 30 children in each DIF group, providing there are no other dependencies, therefore only a selection of the available demographics were used for this analysis. However, a further challenge of DIF is the extent to which it is possible to make decisive interpretations with reduced sample sizes (subgroups of a full sample) with polytomous data (Linacre 2013). Due to a diminished sample size, subgroups of a sample increase the standard error of item calibrations and category information.

The sample size of the study was based around an intention to examine DIF for age and gender. However, additional exploration of reasons for referral categories were also undertaken to provide direction for future development of the ACHIEVE Assessment. Only those categories identified as having sufficient numbers (N>30) of children were used. In order to maximise the information available for DIF analyses, the combined data set of parent and education questionnaires, with items treated differently as appropriate, was used.

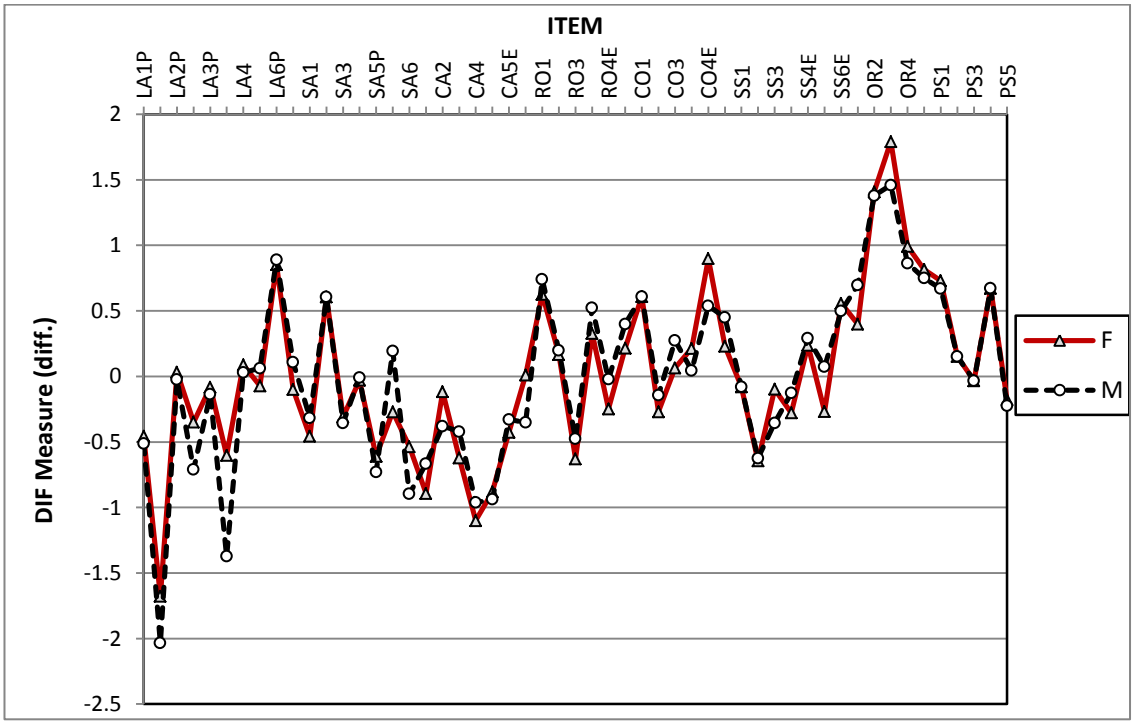
The specification function "PSELECT=" was used within Winsteps to select only those children for whom data on a particular characteristic was available. For example, those with age data missing were excluded from the DIF age analysis and those with reasons for referral missing were excluded from the reasons for referral DIF analysis.

Items from the Emotions and Sensations section have been excluded from the reporting in the DIF analyses, as the low number of responses does not provide sufficient information.

#### 6.6.7.1 Gender

Combining parent and education questionnaires provides a group of 141 girls and 585 boys for DIF analysis. Of the 53 items (including respondent-specific versions), only one shows significant and meaningful DIF sufficient to have an effect; LA3E "Manages snacks/lunch at school" is 0.77 logits ($p<0.05$) easier to endorse when rating boys than girls. There are no significant differences in the average age of boys and girls or the proportion of reasons for referral.

**Figure 6-18 - DIF as a function of gender**




### 6.6.7.2 Age

Table 6-14 details the number of children for each year of age when using the combined data set. Again, to enhance the available information, each group (focal group) was individually analysed against all of the other groups combined (reference group), as recommended by Linacre (2013). Due to the requirements for DIF focal group size, analysis was only carried out for children 4-10 years old. Data from children 11-17 years old was maintained within the reference group. As items with parent or education specific versions had fewer responses, item entry details were checked for each group to verify whether DIF analysis was appropriate.

Appendix 12 features a table that includes information about those items that exhibit differential function according to a particular age group. The symbol "<" in the table indicates items for which there was less than 30 responses for that group. An asterisk (*) indicates instances of significant DIF. Entries in bold indicate instances of significant ($t > 2.00$ / $p<0.05$) and meaningful (size >0.64/<-0.64) DIF for items with more than 30 responses for the particular age groups.

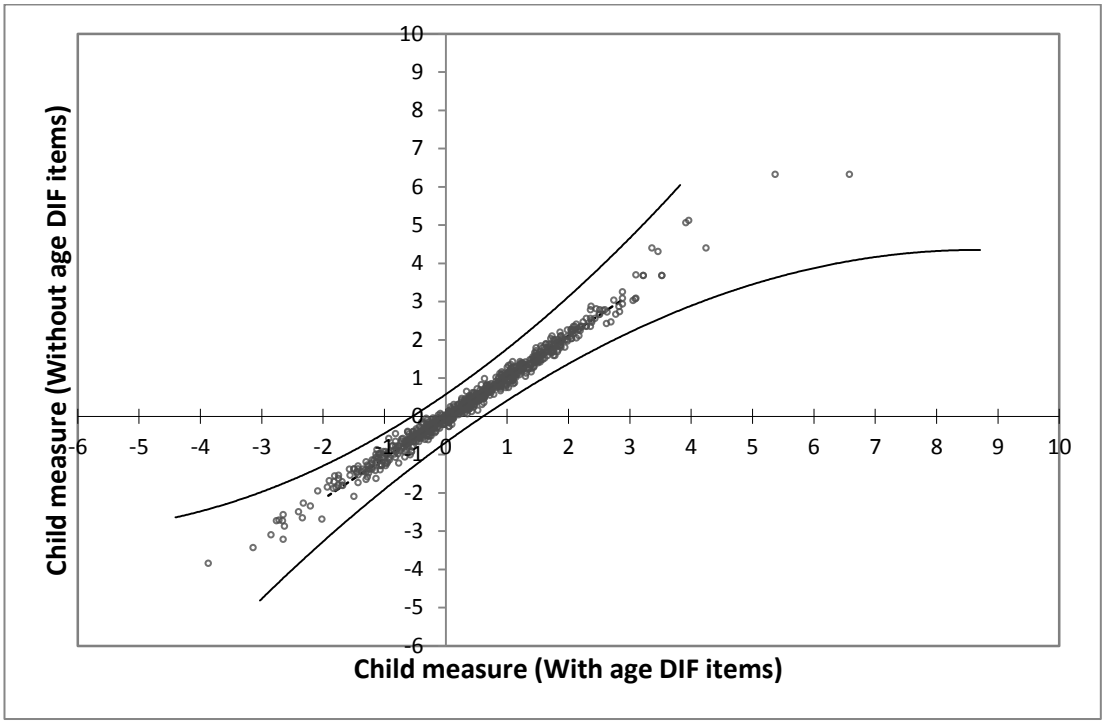
After accounting for low item responses, 5 items have instances of significant and meaningful DIF across multiple age groups. The age group with the most instances of DIF is 4 year olds and there are no instances of significant and meaningful DIF for 6, 7, 8, or 9 year old children. The maximum instances of DIF for one item is 3 for item SA6 "Dresses self after P.E". Multiple instances of DIF for a single item occur for either the two youngest age groups, or the youngest and oldest age groups.

**Table 6-14- Age sample sizes for DIF analysis**

| Age (years) | N |
|---|---|
| **4** | 47 |
| **5** | 66 |
| **6** | 160 |
| **7** | 95 |
| **8** | 76 |
| **9** | 91 |
| **10** | 86 |
| **11** | 28 |
| **12** | 23 |
| **13** | 19 |
| **14** | 10 |
| **15** | 7 |
| **16** | 3 |
| **17** | 4 |

In order to assess the impact of the items with instances of DIF on child measures, separate calibrations of child measures were generated with and without those items as per recommendations (Bond and Fox 2015). Figure 6-19 includes a cross plot of the two sets of child measure calibrations. Overall, the items demonstrating as having multiple instances of significant and meaningful DIF have little statistically significant impact on child measures.

**Figure 6-19 - Child measures with and without items exhibiting age-related DIF**




### 6.6.7.3 Reasons for Referral

Appendix 13 includes a table of information about those items that exhibit differential item function according to reasons for referral. The symbol "<" indicates <30 responses and an asterisk (*) indicates instances of significant DIF. There are 11 items that have instances of significant and meaningful DIF according to reasons for referral. However, 35 items (including parent and education specific versions) have no instances of DIF according to reasons for referral. The reason for referral category with the most instances of DIF is category 5 – suspected or diagnosed autism spectrum disorder (ASD). There are enough responses to many of the items to have confidence in the statistical significance of the results. However, due to the mixed nature of the sample, including multiple reasons of referral and ages, it is not clear whether instances of DIF result from the impact of a single functional difficulty or age interaction.

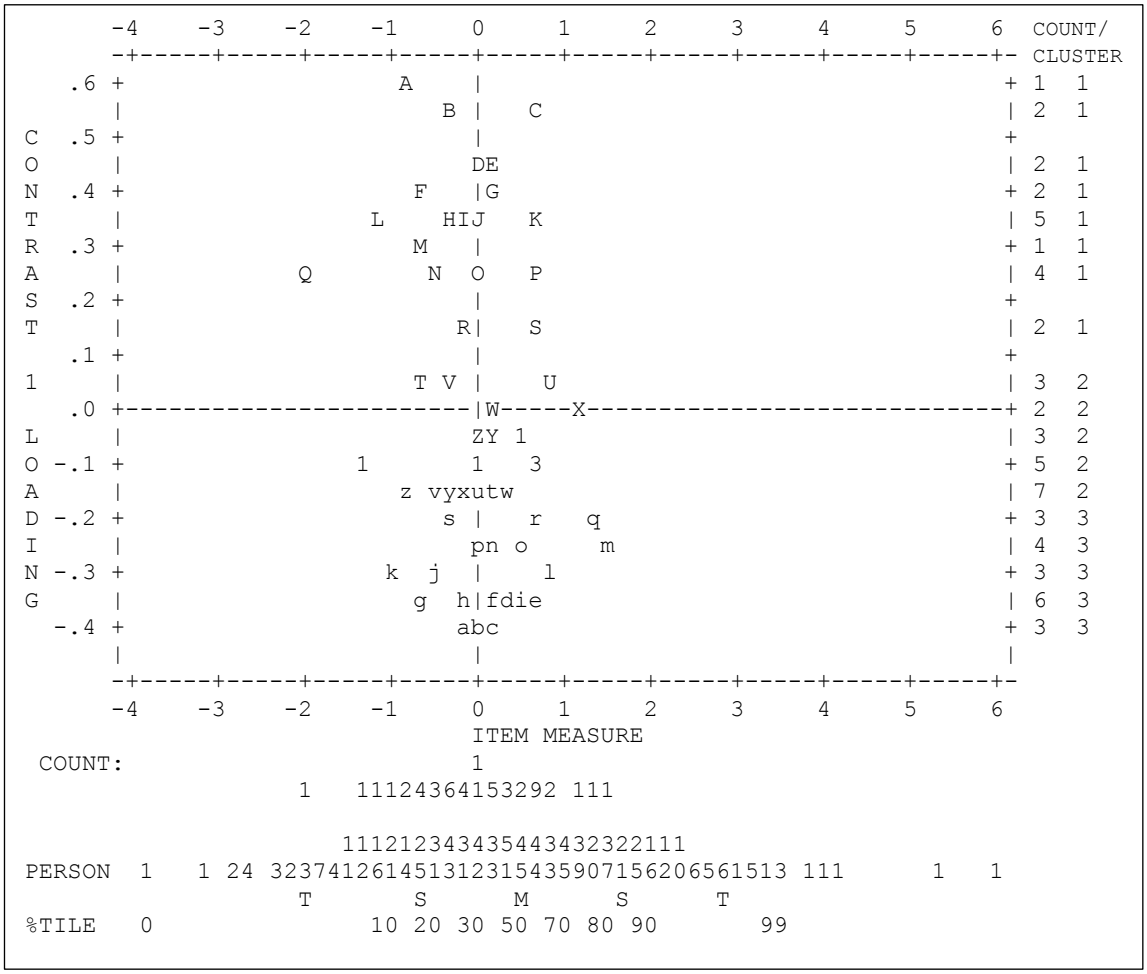
This section details results from the Principal Components Analysis. Table 6-15 includes details of the standardised residuals from PCA. Each instance of raw variance observed is within 0.2% of that expected for the Rasch model for this assessment, supporting the unidimensionality of the assessment. In addition, although the unexplained variance in each of the contrasts is above 2 eigenvalues, the percentages of total variance are all below 5%. The largest unexplained contrast is less than half the size of the variance explained by the children, therefore the potential impact is minimal (Linacre 2013).

**Table 6-15 - Principal Components Analysis**

| | Eigenvalue | Observed (%) | Expected (%) |
|---|---|---|---|
| **Total raw variance in observations** | 107.78 | 100.00 | 100.00 |
| **Raw variance explained by measures** | 49.78 | 46.20 | 46.00 |
| **Raw variance explained by children** | 36.78 | 34.10 | 34.00 |
| **Raw Variance explained by items** | 13.01 | 12.10 | 12.00 |
| **Raw unexplained variance (total)** | 58.00 | 53.80 | 54.00 |
| **Unexplained variance in 1st contrast** | 4.76 | 4.40 | |
| **Unexplained variance in 2nd contrast** | 3.67 | 3.40 | |
| **Unexplained variance in 3rd contrast** | 3.35 | 3.10 | |
| **Unexplained variance in 4th contrast** | 2.30 | 2.10 | |
| **Unexplained variance in 5th contrast** | 2.16 | 2.00 | |

In addition to the table of residuals, Winsteps provides information about which clusters of items load onto the PCA contrasts. Figure 6-20 displays the loading of the items on the first contrast based on the standardised residuals. Winsteps separates the items into three clusters according to their weighting on the PCA contrast. However, those items that cluster together are not distinctly separate from other clusters placement on the latent trait.

**Figure 6-20 - PCA - Plot of standardized residuals**




In addition to the plot of standardized residuals, Winsteps generates three cross plots that display child measure correlations between each combination of item clusters. The cross plots (Figure 6-21 to Figure 6-23) between child measures on different contrasts indicates generally similar patterns of correspondence. The disattenuated correlation between clusters 1 and 2 is 0.67, between 1 and 3 is 0.86 and between 2 and 3 is 0.97. The strength of the correlations show that child measures on each cluster are more dependent than independent (Linacre 2013). The correlation between 1 and 3 indicates that the child measures are two times more dependent than independent and the correlation between 2 and 3 indicates three times more dependent than independent (Linacre 2013). Therefore, although some additional measurement dimensions do exist they are in the majority the same latent variable (Linacre 2013).

**Figure 6-21 - Cross plot of child measures between PCA clusters 1 and 2**

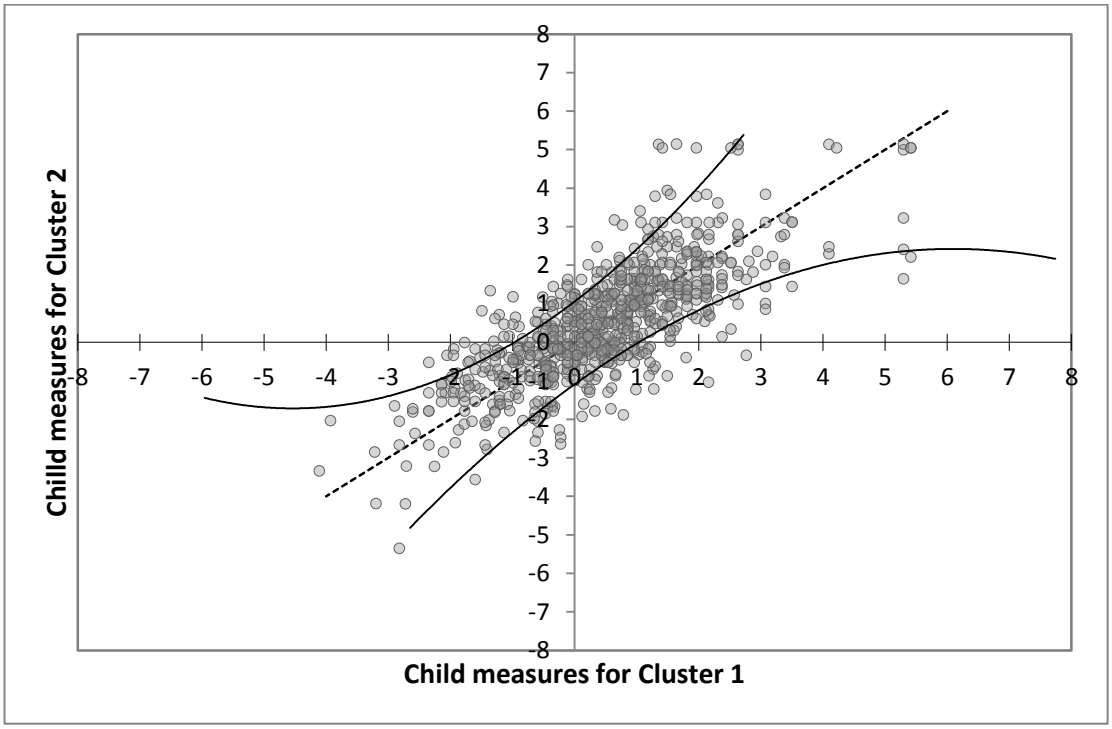



**Figure 6-22 – Cross plot of child measures between PCA clusters 1 and 3**

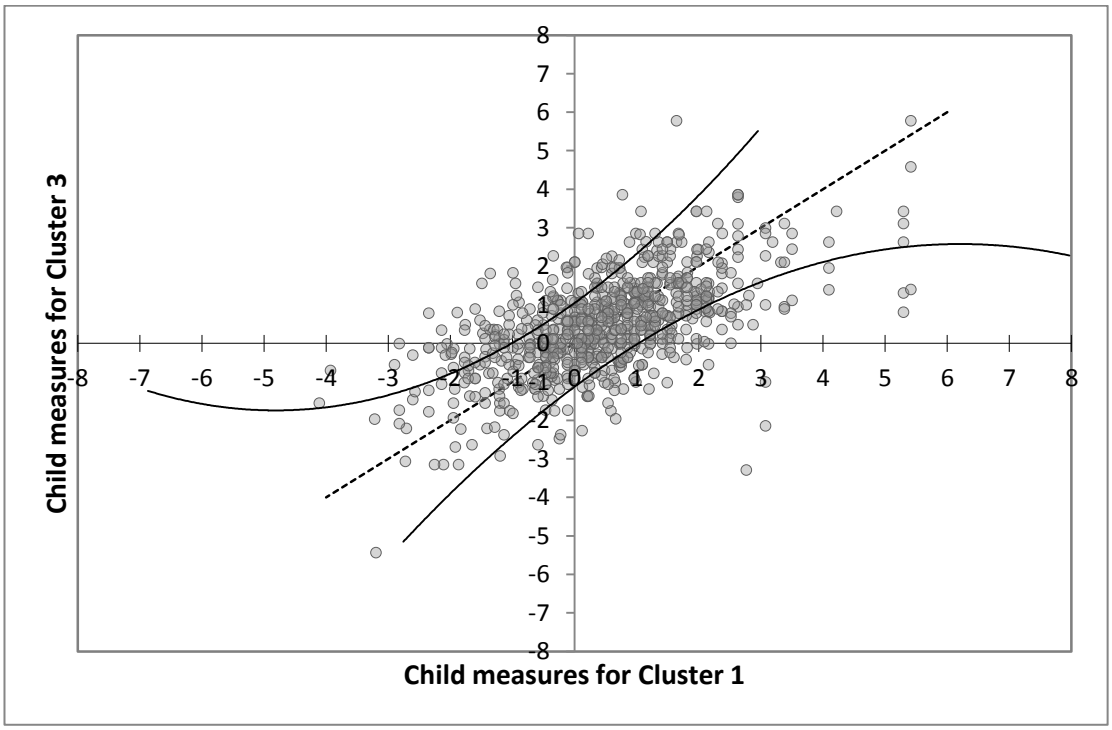
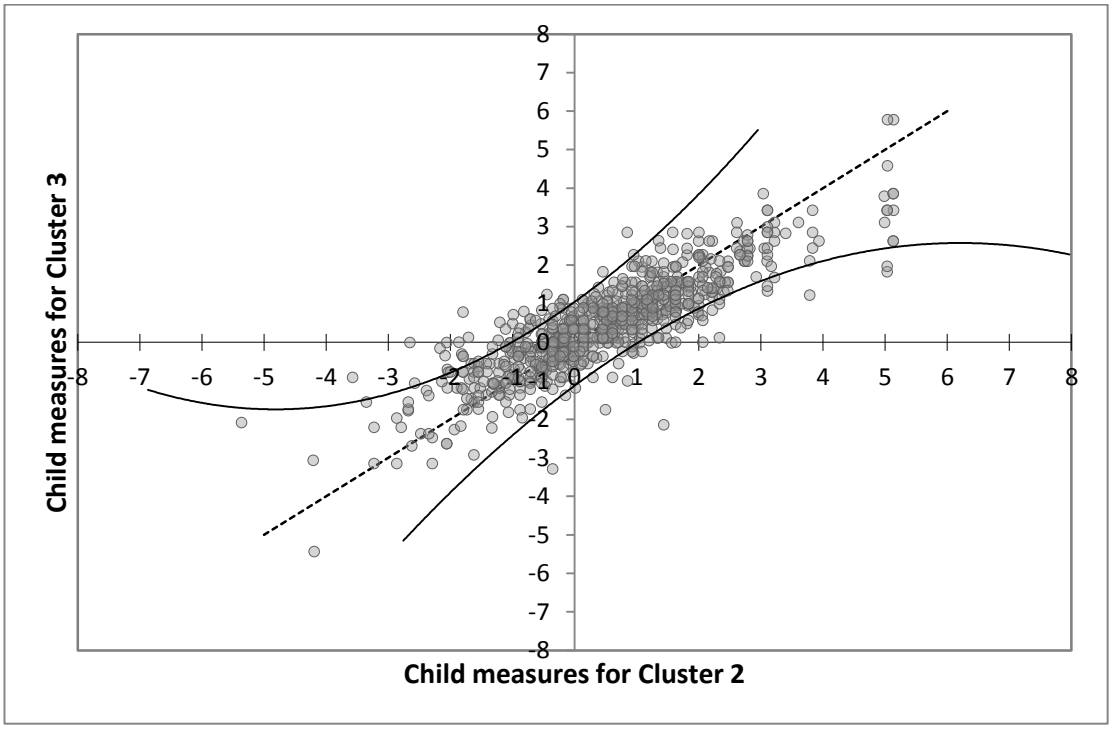


**Figure 6-23 - Cross plot of child measures between PCA clusters 2 and 3**




### 6.6.9 Summary of Subsection Results

The following sections summarise the Rasch findings specific to each section of the ACHIEVE Assessment. An asterisk beside a MnSq value denotes a significant result and MnSq statistics in bold denote misfit to the Rasch model.

#### 6.6.9.1 Home Activities/Life Skills Related to School

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq | G DIF | A DIF | R DIF |
|---|---|---|---|---|---|---|---|---|
| **LA6P** | Effectively moves between home activities | 0.88 | 0.07 | 0.88 | 0.88 | | | |
| **LA6E** | Effectively moves between school activities | 0.07 | 0.08 | 0.86 | **0.86** | | | |
| **LA4** | Cleans up after activity | 0.03 | 0.05 | 0.94 | 0.95 | | | |
| **LA5** | Prepares self for school | 0.02 | 0.05 | 1.08 | 1.07 | | | |
| **LA2P** | Manages clothing at home | -0.03 | 0.07 | 0.92 | 0.95 | | | |
| **LA3P** | Manages snacks/lunch at home | -0.14 | 0.07 | 0.97 | 0.97 | | | |
| **LA1P** | Cleans self after toilet at home | -0.52 | 0.07 | 1.09 | 1.11 | | | |
| **LA2E** | Manages clothing at school | -0.65 | 0.08 | 0.91 | 0.96 | | | |
| **LA3E** | Manages snacks/lunch at school | -1.23 | 0.09 | 0.96 | 0.95 | 1 | | |
| **LA1E** | Cleans self after toilet at school | -1.96 | 0.10 | 1.01 | 1.12 | | | |

Items from the Home Activities (parent) or 'Life Skills Related to School' (teacher) section on the ACHIEVE Assessment are spread across most of the item hierarchy, ranging from -1.96 logits for LA1E 'Cleans self after toilet at school' to 0.88 logits for LA6P 'Effectively moves between home activities'. The average of all items measures on the Home/Life section is -0.35 logits (S.E. =0.25). Of all of the sections on the ACHIEVE Assessment, the Home/Life Sections has the most instances of item variance between parents and teachers (4/6 items).

Within this first section, there is one instance of gender-related DIF for item LA3E, which is easier for teachers to endorse when rating boys rather than rating girls. In addition, LA1E is 0.94 logits easier to endorse when rating 9 year olds in comparison with all other ages. In addition, LA2E is 1.02 logits easier to endorse when rating 10 years olds in comparison with all other ages. There are no instances of DIF related to reasons for referral. Finally, Outfit MnSq values for the LA items range from 0.86 (LA6E) to 1.09 (LA1P) and the infit values range from 0.86 (LA6E) to 1.12 (LA1E), indicating fit to the assumptions of the Rasch model. There are no significant differences between gender mean measures on this section on either questionnaire.

#### 6.6.9.2 School Activities

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq | G DIF | A DIF | R DIF |
|---|---|---|---|---|---|---|---|---|
| **SA2** | Handwriting and shape making | 0.61 | 0.05 | 1.20 * | 1.19 * | | 2 | 1 |
| **SA5E** | Organises self to manage routines | 0.11 | 0.08 | **0.63 *** | **0.64** * | | | |
| **SA4** | Engages in curriculum activities | -0.02 | 0.05 | 0.80 * | 0.81 * | | | |
| **SA1** | Effectively uses learning materials | -0.35 | 0.05 | 0.97 | 0.91 | | | 1 |
| **SA3** | Engages in sports activities | -0.35 | 0.05 | 0.98 | 0.92 | | | |
| **SA5P** | Cleans self after toilet | -0.71 | 0.07 | 1.28 * | 1.27 * | | 1 | |
| **SA6** | Dresses self after P.E | -0.82 | 0.06 | 0.94 | 1.02 | | 3 | 1 |

Similar to the Home Activities/Life Skills items, items from the School Activities section spread across most of the item hierarchy, however with a narrower range from -0.82 (SA6 'Dress self after P.E') to 0.61 (SA2 'Handwriting and shape making'). The average of all item measures is -0.22 (S.E. =0.19), therefore harder than the LA items, however not statistically significantly so. All but one of the items exhibit infit and outfit MnSq parameters within the parameters selected for this study. SA5E

'Organises self to manage routines' has low Infit and Outfit MnSq statistics of 0.63 and 0.64 respectively, indicating overfit to the Rasch model.

There are no instances of gender-related DIF, however SA6 and SA2 exhibit multiple instances of age-related DIF. SA2 is significantly harder for 4 year olds and 5 year old children. SA6 is also significantly harder for 4 year olds and 5 year olds, in addition to being significantly easier for 10 year olds in comparison with the reference group. There is one instance of variance between parent and teacher use of the items; requiring separate versions SA5P and SA5E, reflecting the different content of these items. There is no significant difference between genders' mean measures on this section.

#### 6.6.9.3 Community Activities

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq | G DIF | A DIF | R DIF |
|---|---|---|---|---|---|---|---|---|
| **CA6** | Manages clothes after leisure activities | -0.28 | 0.06 | 1.00 | 1.04 | | 1 | |
| **CA2** | Plays in organised group activities | -0.32 | 0.05 | 0.86 * | 0.87 * | | 1 | |
| **CA5E** | Participates in leisure activities with classmates | -0.32 | 0.09 | 0.78 * | 0.82 * | | | |
| **CA3** | Participates in out of school clubs | -0.43 | 0.06 | 1.20 * | 1.23 * | | | 1 |
| **CA1** | Rides a bike, scooter, etc. | -0.69 | 0.06 | 0.96 | 1.04 | | | 1 |
| **CA5P** | Participates in leisure activities with family | -0.91 | 0.07 | 0.93 | 0.94 | | | |
| **CA4** | Participates in social events | -0.97 | 0.06 | 0.83 * | 0.89 * | | | 3 |

All of the Community Activities items rank at the lower end of the full item hierarchy, from -0.97 logits for CA4 to -0.28 logits for CA6. The mean item measure for the Community Activities section is -0.56 (S.E. = 0.11), which is significantly lower than the averages of the Organisation, Physical Skills, Social Skills, Confidence and Routine sections. All of the items in the Community Activities section demonstrate acceptable fit to the Rasch model.

There are two instances of age-related DIF; both items CA6 and CA2 are significantly harder for 4 year olds in comparison with the reference group. In addition, CA3 is significantly harder when endorsing children with social interaction difficulties, CA1

is significantly easier when rating children referred to due to suspected or diagnosed ADD and CA4 is significantly harder to endorse when rating children referred due to ASD or Behavioural/Mental Health difficulties, however easier when endorsing children referred due to visual or auditory impairment. There was one instance of variance requiring separate teacher and parent versions, CA5P and CA5E. There is no significant difference between boys' and girls' mean measures on this section.

#### 6.6.9.4 Routine and Role

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq | G DIF | A DIF | R DIF |
|---|---|---|---|---|---|---|---|---|
| **RO1** | Organises routines | 0.7 | 0.05 | 1.14 * | 1.14 * | | | |
| **RO4P** | Understands responsibilities at home | 0.49 | 0.07 | 0.87 * | 0.88 | | | |
| **RO5** | Manages multiple responsibilities | 0.37 | 0.05 | 0.74 * | 0.74 * | | | |
| **RO2** | Copes with changed routines | 0.19 | 0.05 | 0.97 | 0.95 | | | |
| **RO4E** | Understands responsibilities at school | -0.06 | 0.08 | 0.72 * | 0.75 * | | | |
| **RO3** | Copes with variety of activities | -0.49 | 0.05 | 0.77 * | 0.80 * | | | |

Items from the routine and role section of the ACHIEVE Assessment spread across the entire item hierarchy. The mean measure of the items in this section is 0.20 (S.E. = 0.17) which significantly differs from the average measure of the community activities and Organisation sections only. However, RO3 ranks lower than 3 Community Activities items on the hierarchy and RO1 ranks closely with OR items at the top of the hierarchy. All of the Routine and Role items demonstrate acceptable fit to the Rasch model and there are no instances of DIF according to gender, age or reasons for referral.

#### 6.6.9.5 Confidence

The confidence items, relating to children's volition, are among some of the hardest items on the ACHIEVE Assessment; however CO2 'Enjoys daily activities' ranks within the lower, easiest half of the hierarchy. The mean item measure for this section is 0.29 (S.E. = 0.12) which is significantly lower than Organisation and significantly higher than life, community and school activities. All but one of the

items demonstrates acceptable fit to the Rasch model. Item CO4P 'Tells parents what wants to get better at' demonstrates underfitting Outfit and Infit values.

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq | G DIF | A DIF | R DIF |
|---|---|---|---|---|---|---|---|---|
| **CO1** | Confident in abilities | 0.6 | 0.05 | 0.98 | 0.91 | | | |
| **CO4E** | Tells teachers what wants to get better at | 0.59 | 0.08 | 1.01 | 1.02 | | | |
| **CO5** | Keeps trying despite challenges | 0.4 | 0.05 | 1.17 * | 1.13 * | | | 1 |
| **CO3** | Satisfied with activity performance | 0.23 | 0.05 | 1.12 * | 1.06 | | 2 | 1 |
| **CO4P** | Tells parents what wants to get better at | 0.08 | 0.07 | **1.41 *** | **1.42** * | | | |
| **CO2** | Enjoys daily activities | -0.16 | 0.05 | 1.01 | 0.95 | | 2 | |

There are no instances of gender-related DIF, however items CO3 and CO2 both exhibit DIF as being easier to endorse when rating 4 year old or 5 year old children. In addition, items CO3 and CO5 exhibit DIF as being easier to endorse when rating children referred for reasons relating to developmental delay. The mean measure for girls is 0.44 logits more than for boys ($p<0.05$).

#### 6.6.9.6 Social Skills

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq | G DIF | A DIF | R DIF |
|---|---|---|---|---|---|---|---|---|
| **SS5E** | Asks for support needed at school | 0.51 | 0.08 | **1.34 *** | **1.33** * | | | |
| **SS4E** | Understands others' feelings at school | 0.3 | 0.08 | 0.98 | 1.00 | | | 1 |
| **SS5P** | Asks for support needed at home | 0.01 | 0.07 | 1.22 * | 1.25 * | | | |
| **SS1** | Plays/interacts well with others | -0.07 | 0.05 | 0.83 | 0.83 * | | | |
| **SS4P** | Understands others' feelings at home | -0.15 | 0.07 | 1.20 * | 1.23 * | | | 2 |
| **SS3** | Speaks clearly with others | -0.29 | 0.05 | 1.20 * | 1.21 * | | | 1 |
| **SS2** | Chatty/sociable and talks with friends | -0.62 | 0.05 | 1.16 * | 1.15 * | | 1 | |

Social Skills items are spread throughout the item hierarchy, with a mean item measure of 0.14 (S.E. = 0.14) which is significantly higher than the CA items and significantly lower than the OR items. There are no instances of gender-related DIF. Item SS2 demonstrates age-related DIF wherein it is significantly harder to endorse when rating children aged 4 years old. In addition, items SS4P and SS4E are

significantly harder to endorse when rating children referred due to suspected or diagnosed ASD. SS4P is additionally significantly harder to endorse when rating children referred due to social interaction and SS3 is significantly harder to endorse when rating children referred due to suspected or diagnosed ADD. Six of the seven items demonstrate acceptable fit to the Rasch model; SS5E demonstrates underfit.

#### 6.6.9.7 Organisation (Process Skills)

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq | G DIF | A DIF | R DIF |
|---|---|---|---|---|---|---|---|---|
| **OR3** | Works out problems if stuck | 1.52 | 0.06 | 0.88 * | 0.87 * | | | |
| **OR2** | Maintains concentration | 1.37 | 0.06 | 0.83 * | 0.79 * | | 1 | |
| **OR4** | Follows through instructions | 0.88 | 0.05 | **0.68 *** | **0.66** * | | | |
| **OR5** | Completes activity steps in right order | 0.74 | 0.05 | 0.74 * | 0.73 * | | | |
| **OR1** | Organises and uses objects for activities | 0.63 | 0.05 | 0.74 * | 0.75 * | | | |

The Organisation (process skills) items are all within the 10 hardest items according to the hierarchy. The average item measure of 1.03 logits (S.E. = 0.18) is significantly higher than the average item measure for each of the other sections on the ACHIEVE Assessment. There are no instances of gender-related DIF or DIF according to Reasons for Referral groups for this section; however, OR2 exhibits DIF wherein it is easier to endorse when rating 4 year old children. All of the items except OR4 demonstrate acceptable fit to the Rasch model. With infit and outfit MnSq values below 0.7, OR4 demonstrates overfit to the Rasch model assumptions.

#### 6.6.9.8 Physical Skills

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq | G DIF | A DIF | R DIF |
|---|---|---|---|---|---|---|---|---|
| **PS1** | Is not clumsy during activities | 0.67 | 0.05 | 1.07 | 1.03 | | | 1 |
| **PS4** | Has adequate physical dexterity | 0.66 | 0.05 | 1.06 | 1.06 | | | |
| **PS2** | Does not lose balance during activities | 0.15 | 0.05 | 1.24 * | 1.18 * | | | 2 |
| **PS3** | Grips objects effectively during activities | -0.04 | 0.05 | **1.31** * | 1.26 * | | | 3 |
| **PS5** | Does not fatigue during activities | -0.22 | 0.05 | **1.53 *** | **1.44** * | | 2 | |

The Physical Skills items spread across upper and lower halves of the item hierarchy. The average item measure for the Physical Skills items is 0.24 (S.E. = 0.18) which is significantly lower than the Organisation items, in addition to being significantly higher than the Community Activities items. PS5 is the only item on the Physical Skills section that does not meet the fit parameters of the Rasch model, displaying underfit on the infit and outfit values. PS3 marginally misfits, showing underfit on the outfit MnSq value.

There are no instances of gender-related DIF for the Physical Skills items, however PS5 demonstrates age-related DIF wherein it is significantly easier to endorse when rating 4 year old children (DIF measure = -1.43) and significantly harder to endorse when rating 10 year old children (DIF measure = 0.72). For DIF related to reasons for referral, PS2 and PS3 are significantly easier to endorse when rating children referred due to suspected or diagnosed ASD. In addition, items PS1 and PS2 are significantly harder to endorse when rating children referred due to visual or auditory impairment. Finally, PS3 is significantly easier to endorse when rating children referred due to suspected or diagnosed ADD and when rating children referred due to sensory processing difficulties.

#### 6.6.9.9 Emotions and Sensations

| Code | Content | Measure | S.E. | Outfit MnSq | Infit MnSq |
|---|---|---|---|---|---|
| **EM4** | Appropriately sensitive | 1.13 | 0.22 | 1.36 | 1.38 |
| **EM3** | Undaunted by new experiences | 0.59 | 0.2 | 0.69 | 0.66 |
| **EM2** | Confident and self-assured | 0.11 | 0.2 | 1.08 | 1.01 |
| **EM5** | Appropriate level of alertness | 0.07 | 0.2 | 0.99 | 1.00 |
| **EM1** | Calm and happy to be separated | -1.38 | 0.22 | 0.76 | 0.79 |

The Emotions and Sensations items spread across the item hierarchy, with an average measure of 0.10 logits (S.E. = 0.42). The Emotions and Sensations items are significantly different to the OR items only. The smaller number of responses to these items mean it was not possible to analyse for instances of DIF and although the MnSq values for items EM3 and EM4 are beyond the acceptable ranges for this study, the ZSTD values are not sufficient (i.e. >2/<-2) to infer misfit to the Rasch model.

The following section reports an investigation into the differences between parent and teacher report of children's participation. This analysis includes only those children for who parent and education data is available. In addition, items identified as being variant between the two respondents have been removed and item measures anchored in order to avoid any impact from looking at child measures for individual sets of items. Children receiving a maximum measure and those with an outfit MnSq >2.0 were also removed to ensure the information is an accurate representation of differences between parent and education measures.

**Table 6-16 - Characteristics of matched sample**

| Age (years) | N | % |
|---|---|---|
| 3.5 – 4.4 | 22 | 6.6 |
| 4.5 – 5.4 | 31 | 9.3 |
| 5.5 – 6.4 | 74 | 22.2 |
| 6.5 – 7.4 | 43 | 12.9 |
| 7.5 – 8.4 | 34 | 10.2 |
| 8.5 – 9.4 | 42 | 12.6 |
| 9.5-10.4 | 39 | 11.7 |
| 10.5 – 11.4 | 13 | 3.9 |
| 11.5 – 12.4 | 9 | 2.7 |
| 12.5 – 13.4 | 8 | 2.4 |
| 13.5 – 14.4 | 5 | 1.5 |
| 14.5 – 15.4 | 3 | 0.9 |
| 15.5 – 16.4 | 1 | 0.3 |
| 16.5 – 17.4 | 2 | 0.6 |
| Not completed | 8 | 2.4 |

| Gender | N | % |
|---|---|---|
| Female | 61 | 18.3 |
| Male | 269 | 80.5 |
| Not completed | 4 | 1.2 |
| **School placement** | **N** | **%** |
| Language class | 1 | 0.3 |
| Mainstream | 277 | 82.9 |
| Nursery | 39 | 11.7 |
| Special needs school | 3 | 0.9 |
| Not completed | 14 | 4.2 |
| **Ethnicity** | **N** | **%** |
| White Scottish | 252 | 75.4 |
| White English | 4 | 1.2 |
| White Welsh | 1 | 0.3 |
| White British | 19 | 5.7 |
| White Gypsy/Traveller | 1 | 0.3 |
| White Polish | 4 | 1.2 |
| Any other white group | 2 | 0.6 |
| Mixed/multiple ethnic group | 1 | 0.3 |
| Chinese group | 1 | 0.3 |
| African group | 1 | 0.3 |
| Unknown | 48 | 14.4 |

Thus, the following analysis includes 38 items completed by parents and teachers for 334 children. The characteristics of the sample are included in Table 6-16. The mean age of the matched sample is 7.82 years (S.E = 0.14), thus not significantly different to the full sample (z=0.47).

Figure 6-24 is a cross plot of the individual child measures between parent and education calibrations on all of the participation items. There is minimal indication of correlation between the two sets of measures, with a large portion of the child measure plots lying beyond the confidence intervals. There is no clear indication of bias or tendency for either respondent to score higher than the other does. Correlation coefficient between the two sets of measures is 0.33.

Figures 6-25 to 6-31 are cross plots of child measures between parent and education calibrations for individual sets of items. In general, examination of the cross plots do not indicate a strong relationship between the parent and education reporting of children's measures when items are anchored to a common rating scale and items are invariant. There are significant small to moderate correlations between parent and education calibrations of child measures for individual subsections of the ACHIEVE Assessment. The largest correlation, at .457 ($p<0.05$) is between parent and education report of Social Skills. The smallest correlation, at .215 ($p<0.05$) is between parent and education report of Organisation. Furthermore, there is no strong indication of bias between parent and education reports.

**Figure 6-24 - Cross plot of parent and teacher report on ACHIEVE Assessment**

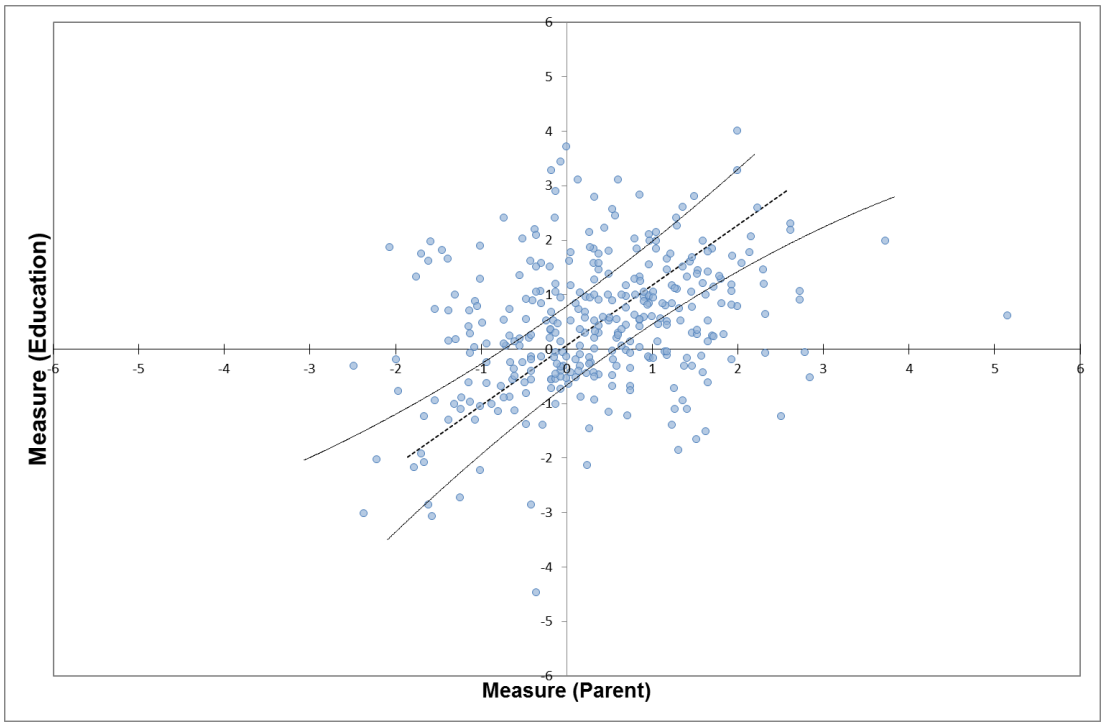


**Figure 6-25 - Cross plot of parent and teacher report on school activities**

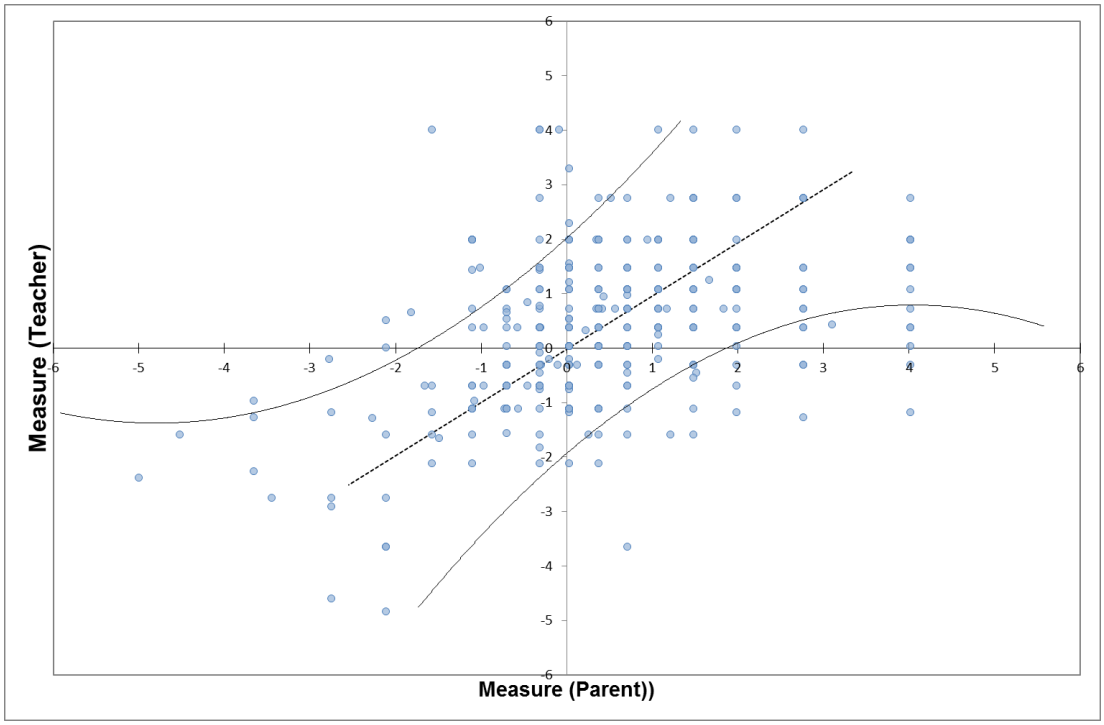



**Figure 6-26 - Cross plot of parent and teacher report on community section**

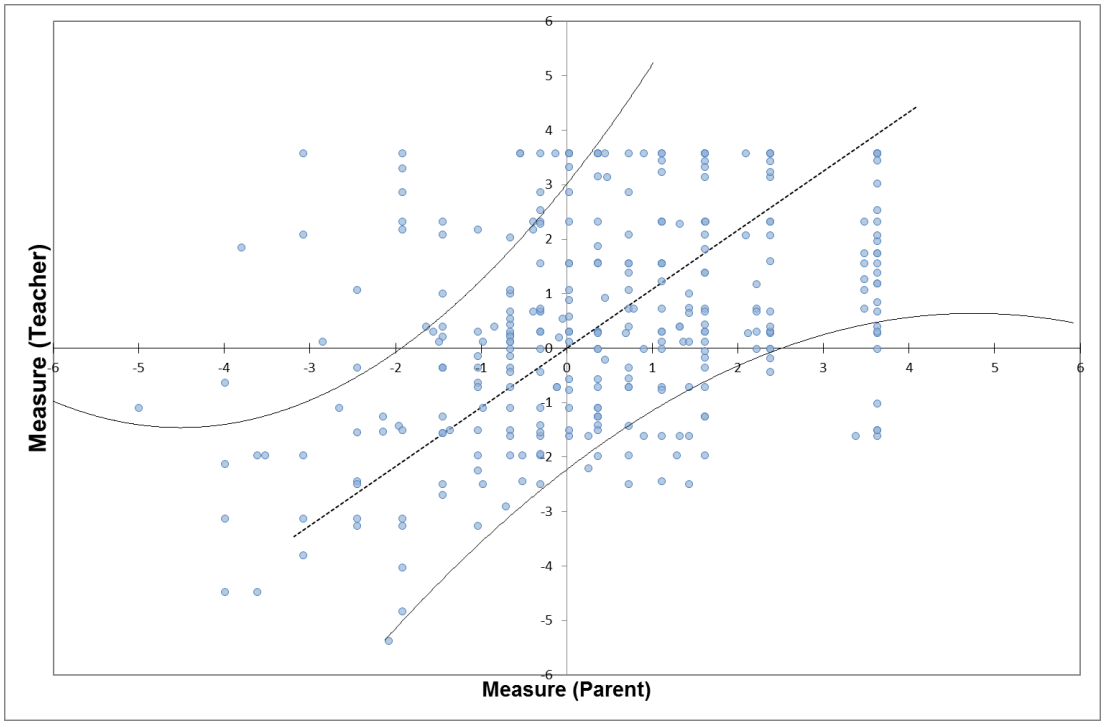


**Figure 6-27 - Cross plot of parent and teacher report on 'routine' section**

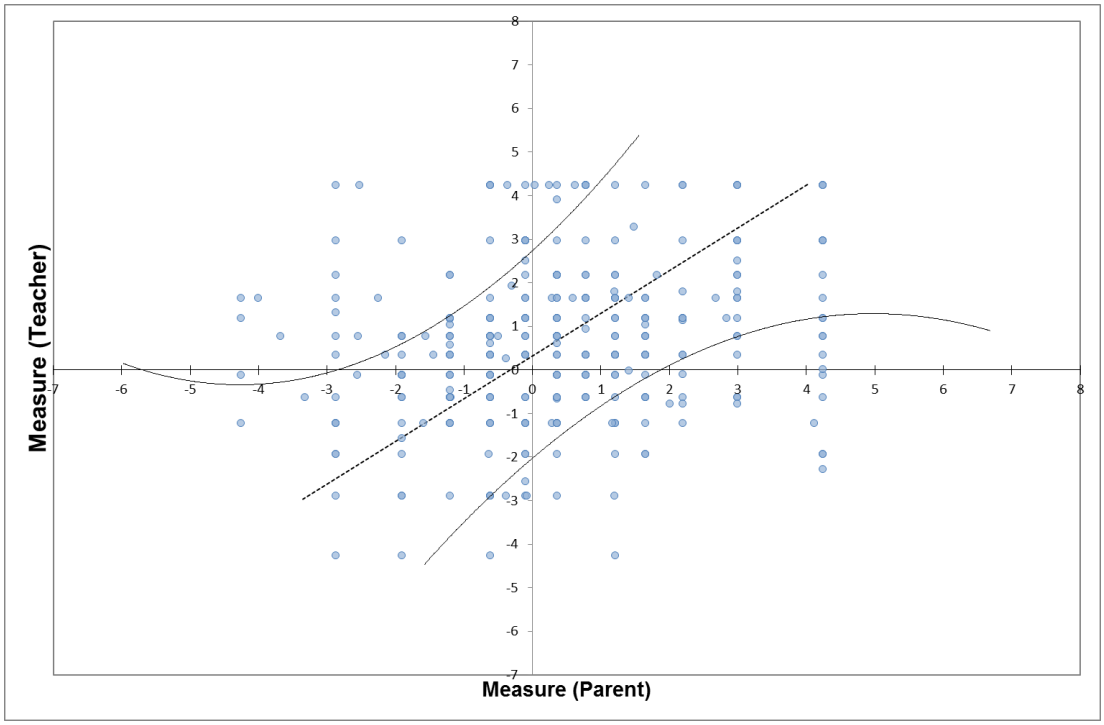



**Figure 6-28 - Cross plot of parent and teacher report on 'confidence' section**

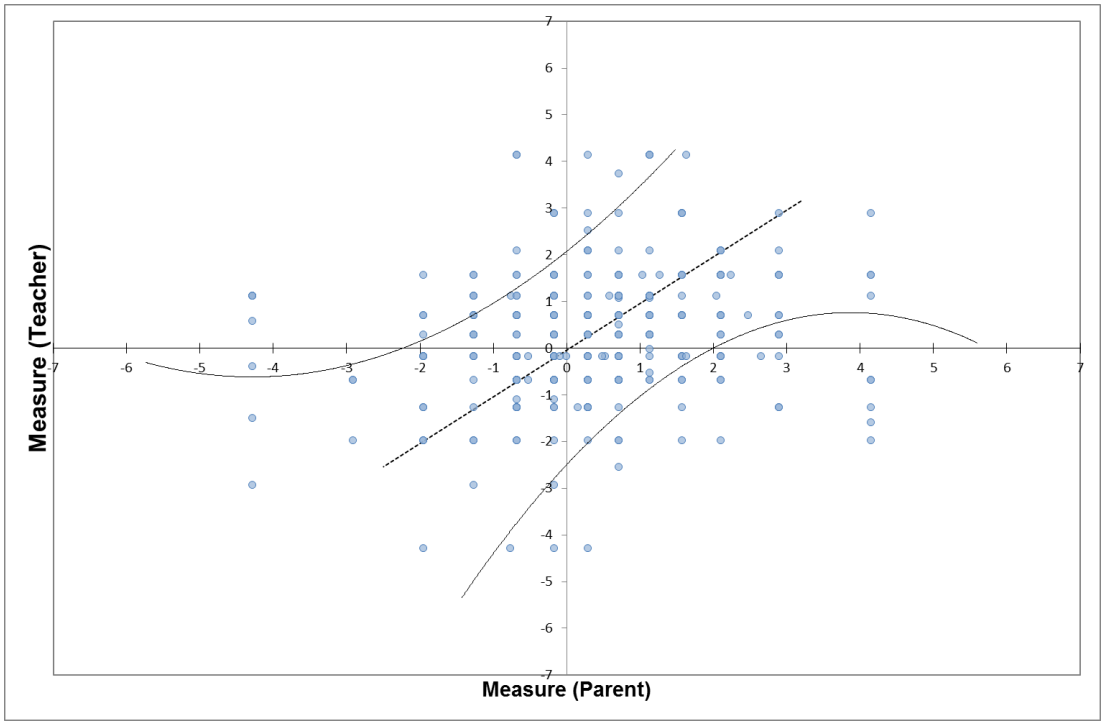


**Figure 6-29 - Cross plot of parent and teacher report on 'social skills' section**

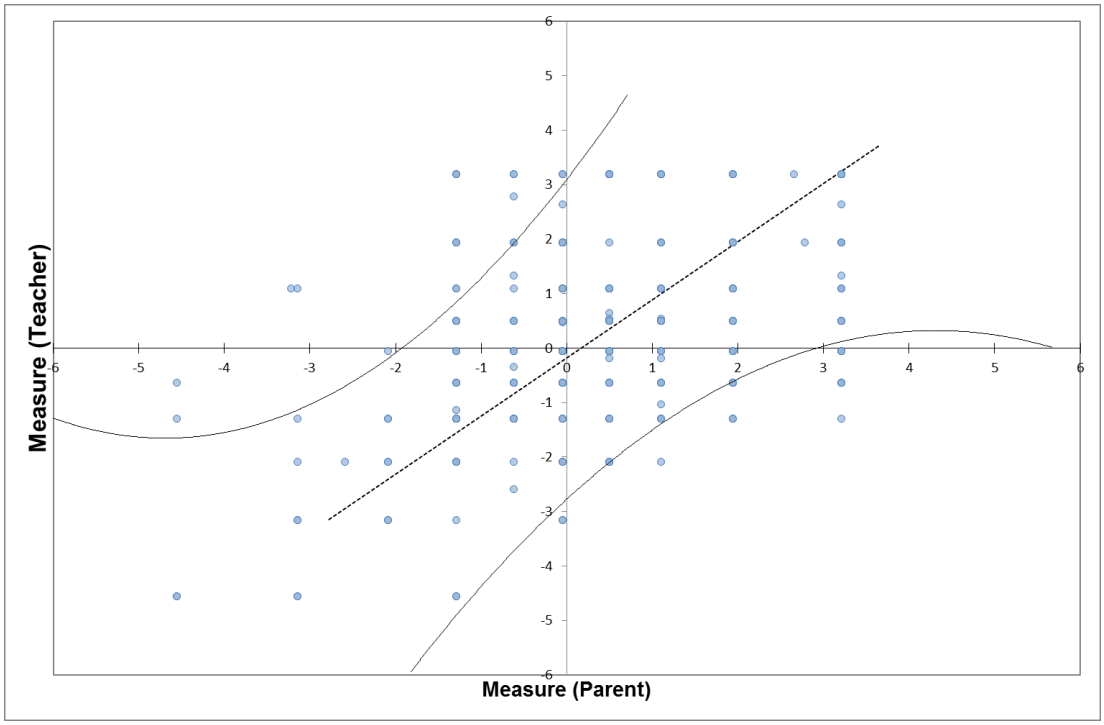



**Figure 6-30 - Cross plot of parent and teacher report on 'organisation' section**

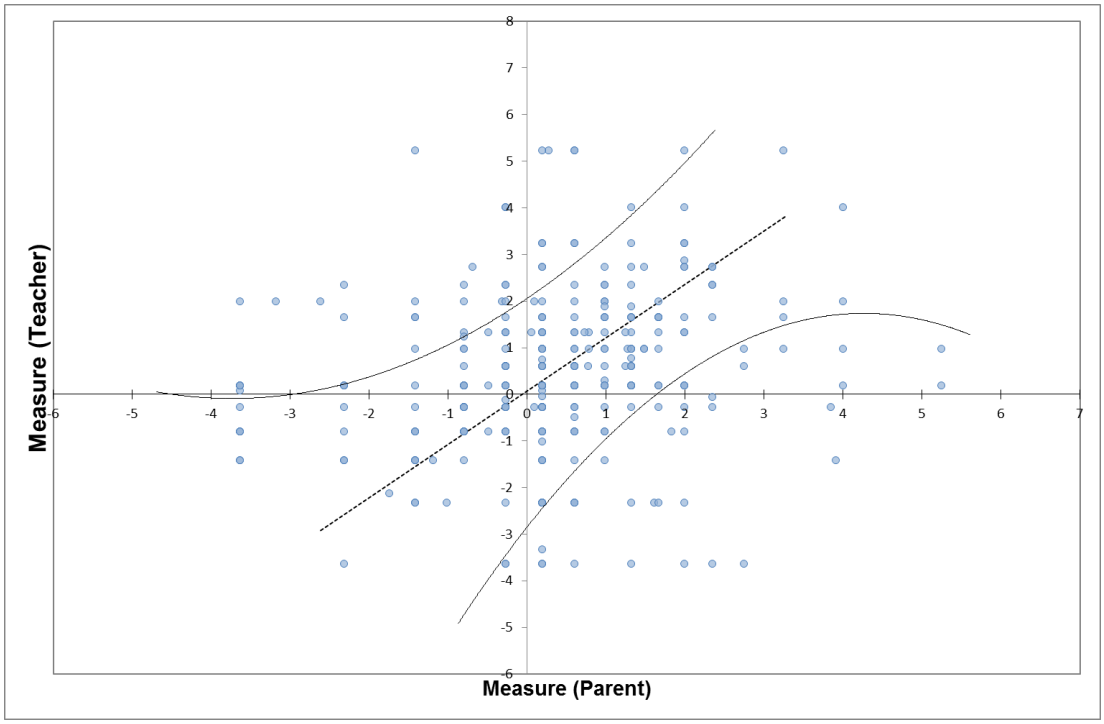
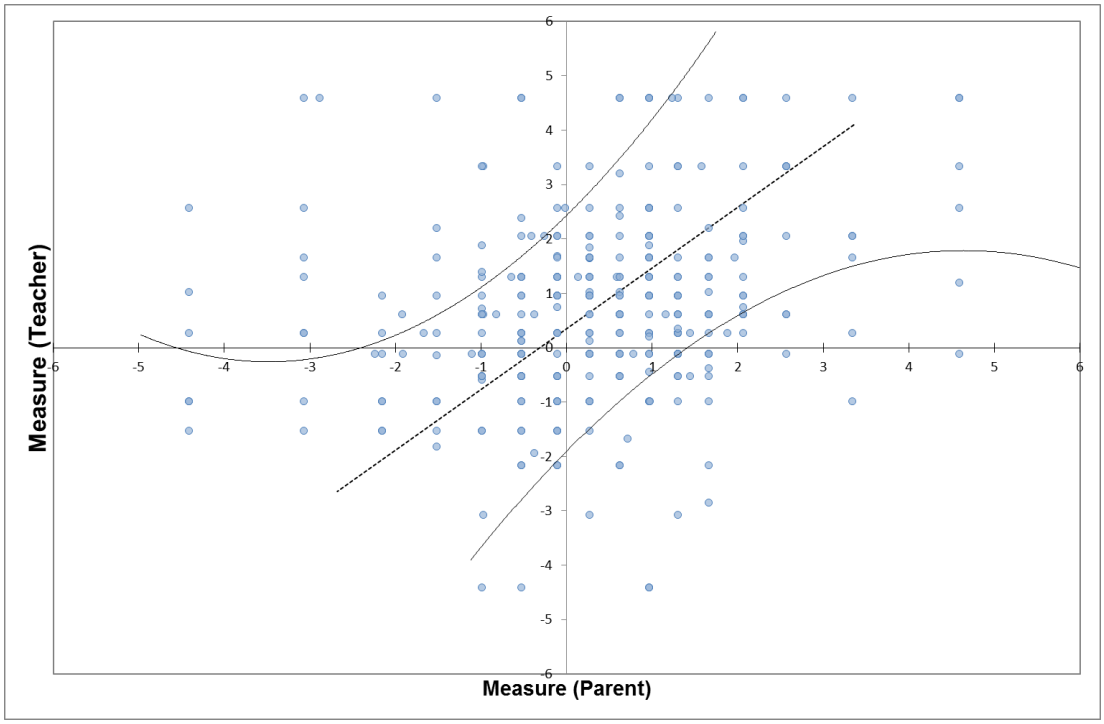


**Figure 6-31 - Cross plot of parent and teacher report on 'physical skills' section**




In addition to the small correlations between each respondent's reports of child measures on individual subsections of items, paired sample t-tests indicate significant differences in the means. Table 6-17 displays the mean difference between parent and teacher measures of children on individual sections of items. The significant differences are emphasised in bold.

**Table 6-17 - Parent and teacher mean measure comparison**

| | Parent | Education | Difference | P |
|---|---|---|---|---|
| **All** | 0.42 | 0.52 | -0.10 | 0.27 |
| **Life** | **0.32** | **0.60** | **-0.28** | **0.04** |
| **School** | 0.47 | 0.44 | 0.03 | 0.77 |
| **Community** | 0.52 | 0.59 | 0.07 | 0.65 |
| **Routine** | **0.31** | **0.64** | **-0.33** | **0.02** |
| **Confidence** | 0.48 | 0.43 | 0.05 | 0.63 |
| **Social** | 0.59 | 0.46 | 0.13 | 0.30 |
| **Organisation** | 0.35 | 0.49 | 0.14 | 0.26 |
| **Physical** | **0.31** | **0.70** | **-0.39** | **<0.01** |

In summary, there are only small correlations between parent and education measures of individual children's participation. In addition, there are significant

differences between parent and teacher report on three of the ACHIEVE Assessment subsections. The direction and extent of difference vary between subsections.

## 6.7 Conclusion

Following implementation of the ACHIEVE Assessment across Scotland, Rasch modelling approaches were used to analyse the measurement qualities of the assessment. The analysis included investigation of the extent to which the ACHIEVE Assessment targets the sample of interest. In addition, analysis investigated whether the ACHIEVE Assessment met the requirement of true measurement according to the underlying assumptions of the Rasch model. Finally, using Rasch analysis allowed for investigation of the associations between parent and teacher reports, including different ease of item endorsability between respondents and associations between their reports of children's participation.

The ACHIEVE Assessment targets the population of children included in the study. The ages of children and their reasons for referral are expected to reflect those with which the assessment is intended to be used, due to the sampling strategy adopted. The ACHIEVE Assessment distinguishes between different levels of participation, providing a resource for investigating factors associated with children's participation.

In addition to targeting the sample, a majority of the ACHIEVE Assessment participation items fit the requirements of the Rasch model. The environment items do not fit the Rasch model when analysed as a component of the full assessment, indicating that those items measure a separate dimension. However, the environment items do fit the model when analysed as a separate subsection, thus may be a useful basis for developing a more complex assessment of the environment. The misfitting items are relevant for inclusion within the ACHIEVE Assessment based on their content, and are few enough to not be of concern. Therefore, the ACHIEVE Assessment is a unidimensional measure of children's participation which includes information about a variety of associated factors.

Although the environment items fit the requirements of the Rasch model, they are relatively easy for parents and teachers to endorse with high scores. There is a ceiling

effect whereby parents and teachers are scoring their children's environments as much higher than the items are able to capture. Therefore, the environment items have limited use in establishing associations between environmental characteristics and children's participation. However, given the important association between the environment and children's participation, further development of these items will be important.

DIF analysis, scatterplots and t-tests with anchored data files show that 10 items on the ACHIEVE Assessment differ in function between parent and teacher responses. Splitting the variant items allows for their continued use within the ACHIEVE Assessment, although those items are not suitable for comparison across respondents. The remaining, invariant items are suitable for comparison between respondents and, together with the variant items, fit the underlying assumptions of the Rasch model.

There are some instances of DIF associated with age and reasons for referral on the ACHIEVE Assessment. The items that exhibit DIF have minimal overall impact on the child measures, thus their continued inclusion in the ACHIEVE Assessment is appropriate. In addition, it is likely that the DIF reflects the sample population and the complexity of the construct, particularly in terms of reasons for referral.

Finally, the analysis indicates weak associations between parent and teacher reports of children's participation using the ACHIEVE Assessment. The weak association between respondents on the ACHIEVE Assessment may reflect a variety of influences, including genuine differences in children's participation across settings, different expectations of children within those settings and demographics such as age, years of teaching experience or maternal self-efficacy beliefs affecting the respondent's perspective in different settings. The following chapter explores the findings from the study in the context of current literature.

# Chapter 7 – Discussion

## 7.1 Introduction

Participation is a complex construct that is a current priority within healthcare research and practice. Understanding children's participation is crucial to preventing and addressing barriers to their full involvement in all aspects of life (UNICEF 2013). Therefore, researchers and clinicians use assessments to gather information about children's participation. The contextual nature of participation means component-focused assessments as traditionally used are of little conceptual relevance. Instead, ecological assessments that capture children's participation allow identification of participation in all its complexity.

The current study involved nation-wide implementation and analysis of the ACHIEVE Assessment. Parents across Scotland were invited to participate in the study by consenting to inclusion of their children's questionnaires as data. Rasch modelling was used to analyse the data and establish the measurement qualities of the ACHIEVE Assessment. The purpose of the study was to answer the following questions:

- Is the ACHIEVE Assessment a quality, unidimensional measure of children's participation as demonstrated through Rasch modelling?
- How does the hierarchical structure of the ACHIEVE Assessment items contribute to understandings of children's participation?
- To what extent can information from parents and teachers be usefully combined or compared to further understandings of the complexity of children's participation?

The purpose of the following chapter is to discuss findings from the current study within the context of existing research investigating children's participation. Section 7.2 discusses the sample characteristics in the context of existing research. Section 7.3 of the chapter focuses on analysis of the ACHIEVE Assessment measurement qualities using Rasch modelling. Section 7.4 discusses the item hierarchy and measurement

qualities within the context of current conceptualisations of participation, including the contextual nature of the construct. Finally, section 7.5 discusses the challenges and practical implications of using multi-informant approaches to measuring children's participation, before concluding with a summary in section 7.6.

## 7.2 Nature of the Sample

In order to ensure the quality and relevance of the current study, the focus was on collecting 'real-world' data that reflects the intended use of the ACHIEVE Assessment. The study therefore includes a clinical sample of 402 children ranging in age from 4 to 17 years old, boys and girls. Few existing studies analysing participation assessments include the same age range as the current study; many include either young children, primary aged children or adolescents (Phillips et al. 2013, Chien et al. 2014a, Rainey et al. 2014). At 7.91 years, the mean age of children included in the current study skewed towards a younger age and is lower than that in research studying a similar age range (Bourke-Taylor and Pallant 2013). However, this likely reflects the sampling techniques, as children with whom therapists used the ACHIEVE Assessment were primarily new referrals to services.

In total, 81% of children in the current study sample were boys. Male majority samples are similarly evident in existing research studies reviewed in this thesis (Klaas et al. 2010, Rosenberg et al. 2013a, Anaby et al. 2014, Little et al. 2014). However, the size of the majority varies across each. In addition, in Scotland in 2015, 67% of school pupils with additional support needs relating to impairment, disability and learning difficulty were boys (National Statistics 2016). The figure increases to 71% when dyslexia and other learning difficulties are excluded (National Statistics 2016). Further, DCD, one of the most common reasons for referral in the current study, is at least two times more prevalent in boys in comparison to girls according to existing research (Blank et al. 2012).

In Anaby et al.'s study (2014), children were reported to have a mean number of 3.13 (home), 3.08 (school) or 3.17 (community) functional difficulties. Similarly, children in the current study were referred for a mean of 3.27 reasons relating to functional difficulties or potential diagnoses. The reasons for referral question on the

demographics form also includes diagnosis options, thus direct comparisons between studies may not be appropriate, however does suggest similarities. Of the top 10 most frequently reported reasons for referral, 8 reference functional impairments rather than particular diagnoses. This characteristic reflects the paradigm shift within healthcare practice where the focus is on the impact that disability has on a child's life, rather than on specific features of a particular presenting condition.

The top four reasons for additional support needs for school pupils in Scotland in 2015 were social, emotional and behavioural difficulty, learning difficulty or disability, dyslexia and language or speech disorder. Each of these groups appears to feature much less in the current study. In the current study, 9% were referred due to social interaction difficulties and 6.5% due to behavioural or mental health difficulties. However, the Scottish school statistics also include children not actively seen by health professionals, or those seen by AHPs but not OTs. For example, those children with language or speech disorders will primarily be referred to speech and language therapists. In addition, the low participation of therapists from CAMHS influences the amount of data about children with behavioural or mental health problems in the current study. The different demographic categories and scope of the sample also affect the opportunity for comparison.

Finally, the Scottish school statistics do not include a category for DCD which is a group of children likely captured within the learning disability group, reflecting comorbidities between the two (College of Occupational Therapists 2013). The existing data about children with DCD is variable, prevalence estimates vary between 5 and 20% of all children (Blank et al. 2012). In addition, early research indicates that children with DCD make up between 40% and 60% of paediatric community occupational therapists' caseloads (Dunford and Richards 2003). The larger proportion of DCD in comparison with other conditions in the current study reflects existing knowledge about occupational therapy caseloads, however not to the same extent.

The sample therefore partially reflects characteristics of existing research and available prevalence statistics. The differences between existing research and the population in the current study likely reflect the recruitment strategy and target

sample, the current study using a clinical sample primarily recruited from new referrals to occupational therapy services. The clinical nature of the sample is a particular strength of this study, representing the population with which the assessment is intended for use. In addition, the mixed sample provides information about the measurement qualities of the ACHIEVE Assessment for a wide group of children, supporting its clinical utility. The following sections discuss the findings of the ACHIEVE Assessment analysis.

## 7.3 Quality of the ACHIEVE Assessment According to Rasch Analysis

### 7.3.1 Category Function

Assessments include rating scales in order to demonstrate an increase or decrease in the construct of interest, in this case participation (Streiner 2008). Existing research uses such rating scale assessments to measure children's participation and investigate associations between personal or environmental characteristics and different levels of participation (e.g. Anaby et al. 2014, Goltz and Brown 2014). As the basis of an assessment's measurement qualities, properly functioning rating scale categories are crucial. On the ACHIEVE Assessment, the average child measure for responses to each category increases in line with the rating scale scores. Parent and teacher responses on the ACHIEVE Assessment rating scale, from 1 "none of the time" to 4 "all of the time", therefore reflect a spectrum of agreement (Bond and Fox 2015). Each category progressively represents more of the latent trait than the category below (Bond and Fox 2015). Such progression between categories ensures confidence that a higher score on the rating scale reflects more participation.

In addition, each of the four categories on the ACHIEVE Assessment rating scale is more probable at some point along a spectrum of item difficulty relative to child ability. The category probabilities are ordered; category 1 "none of the time" is most probable before category 2 "some of the time" and so on. In other words, as children's overall participation increases, parents and teachers are more likely to endorse higher scores on the rating scale. Parents and teachers therefore use the rating scale as intended and each category on the ACHIEVE Assessment usefully contributes

towards measurement (Boone et al. 2014). Clinicians or researchers using the ACHIEVE Assessment can have confidence that each category on the rating scale progressively represents an increase in children's participation.

In addition, having enough categories is important for strengthening an assessment's sensitivity to discriminate between levels of a construct and thus provide precise information (Streiner 2008). Keller and Kielhofner (2005) report analysis of the Child Occupation Self Assessment (COSA) in which they added a category to create a 4-point rating scale. The additional category improved the discrimination of the rating scale. The Short Child Occupational Profile (SCOPE) also uses a 4-point rating scale (Bowyer et al. 2007). The ACHIEVE Assessment rating scale structure therefore echoes that of complementary assessments that also have their basis in MOHO. Used together, the three assessments provide clinicians with a rich and comprehensive profile of children's participation across settings (ACHIEVE Alliance 2012).

### 7.3.2 Spread and Targeting

When selecting assessments for use in practice or research, it is important to have confidence that they are suitable for the population or child of interest (Kramer et al. 2009). In addition, enhancing knowledge about children's participation includes investigating personal characteristics or environmental features that are associated with different levels of participation (Anaby et al. 2014, Imms et al. 2016). Such investigations are supported by the use of assessments capable of collecting information about and distinguishing between children who have different levels of participation. Understanding the complexities of children's participation includes capturing information about boys and girls, children of a range of ages and with a variety of potential diagnoses (e.g. Coster et al. 2013a, Anaby et al. 2014, Rosenberg 2015). Assessments therefore need to be able to target heterogeneous populations. Rasch analysis supports investigation of the extent to which an assessment appropriately targets the intended population and distinguishes between groups (Bond and Fox 2015).

Summary statistics provide preliminary information about the targeting of an assessment to a sample, in addition to the spread of data and the assessment's ability

to distinguish between distinct groups of children (Linacre 1994, Boone et al. 2014, Bond and Fox 2015). Child and item reliability statistics in the current study indicate that there is sufficient information in the data to precisely locate items on the latent trait and distinguish between children with different levels of participation (Boone et al. 2014). The high child and item reliability statistics indicate that similar patterns would occur if the analysis were repeated with another sample (Bond and Fox 2015). The summary statistics, alongside category function analysis, therefore emphasise confidence in results from the current study.

In addition to summary statistics, items on the ACHIEVE Assessment are spread across a hierarchy of difficulty that targets a majority of the sample population. Item maps indicate a slight ceiling effect that suggests, for a small number of children, the ACHIEVE Assessment may be too easy for parents and teachers to endorse. If parents and teachers easily and consistently endorse high scores across all items for children with high levels of participation, then it is unlikely that those children will be distinguishable (Velozo et al. 2006). However, although there are instances of children's measures exceeding the item measures, individual category steps for the most difficult items exceed the highest child measures. Therefore, it is still possible to gather information about children with higher levels of participation. Similarly, the high reliability scores in the summary statistics confirm the sufficiency of information available to calibrate child and item measures, despite the potential ceiling effect (Velozo et al. 2006).

In their study analysing the Children's Hand-Skills Ability Questionnaire, Chien and Brown (2012) report a larger ceiling effect than is evident in the current study. Chien and Brown (2012) interpret a ceiling (or floor) effect as being the presence of extreme measures beyond 10% of the sample population. However, there is only one child in the current study for whom a parent has endorsed an extreme score on the ACHIEVE Assessment. Therefore, the impact on the overall discriminative ability of the assessment is minimal. The ACHIEVE Assessment is also within the criteria used to interpret ceiling effect in analysis of the COSA (Keller and Kielhofner 2005) in which having at least 95% of the sample population within two standard deviations of the mean child measure supports the absence of ceiling effect. Therefore, the ACHIEVE

Assessment measures and discriminates between children with a range of participation levels. Such widespread targeting supports the applicability of an assessment to a broad clinical population and thus enhances its clinical utility.

The sample population includes a relatively small number of adolescents, which may influence interpretation of targeting. However, the association between age and participation is most evident when investigating specific activity types (Klaas et al. 2010, Bult et al. 2011, King et al. 2013b). Therefore, it is not anticipated that having a sample with a higher average age would necessarily alter the overall targeting of the ACHIEVE Assessment which includes different types of activities. Further, the ACHIEVE Assessment reliably separates children into six distinct groups of different measures. Researchers compare groups of children with different levels of participation to identify supportive or restrictive aspects of, for example, child characteristics or environmental features (Fauconnier et al. 2009, Coster et al. 2013a, Peny-Dahlstrand et al. 2013, Anaby et al. 2014). The ACHIEVE Assessment's reliability in distinguishing between groups of children with different levels of participation is therefore beneficial for future research and clinical work.

Although conceptually relevant, treating the environment items as a distinct measure creates a set of items that are relatively easy for parents and teachers to endorse, which is an important issue to address further. The fewer items and ease with which respondents endorse the environment items reduces the precision with which it is possible to measure children's environments (Boone et al. 2014). However, given the interaction between children and their context, detailed measurement of environmental characteristics is important to understanding the impact on children's participation. Section 7.4.5 further explores implications of the dimensionality of environment as separate from participation and the need to address the ease with which respondents endorse those items.

The combination of the above information supports use of the ACHIEVE Assessment as a quality measure of children's participation and contributory factors. The participation items appropriately target the study sample that includes boys and girls, over an age range of 14 years and multiple combinations of reasons for referral. The ACHIEVE Assessment therefore demonstrates features of clinical utility by being a

single assessment that is useful for a mixed group of children. However, the environment items require further development to address their ease of endorsability. The following section discusses the measurement implications of DIF between parents and teachers.

### 7.3.3 Parent and Teacher Item Variance

Invariance of item calibrations across applications of an assessment is essential if inferences based on differences between them are to be accurate (Bond and Fox 2015). Item invariance is particularly relevant in the context of the ACHIEVE Assessment, as it would allow for detailed examination of how child characteristics or features of their environment affect their participation across settings. Of the existing research into children's participation, research studies most often include parent or child perspectives. If the ACHIEVE Assessment functions effectively as a multi-informant assessment then it would make a unique contribution to future work by providing a means for comparing parent and teacher report.

Initial investigation of item variance between parent and teacher report was completed using DIF analysis and scatter plots. However, Wolfe and Chiu (1999) recommend analysis steps to follow that support in-depth examination of the extent of variance between time points. Slightly adapting the steps recommended by Wolfe and Chiu allowed for examination of differences between respondents in the current study. Of particular benefit, the procedure involved anchoring category steps and item calibrations to ensure that any conclusions were based on genuine variation in item function. This anchoring therefore allowed for greater certainty in establishing the extent of difference between parent and teacher item calibrations. Comparison of results from the three analysis techniques demonstrated minor differences between the scatterplot analysis and steps recommended by Wolfe and Chiu. However, the Wolfe and Chiu analysis confirmed the outcomes of the Rasch DIF analysis.

In total, 10 of the items on the ACHIEVE Assessment vary in difficulty between parents and teachers. Direct quantitative comparison between parent and teacher responses to those items is therefore inappropriate. When using responses to these items within data analysis, it would be necessary to treat them as separate items each

with single responses, rather than single items with comparable responses. Missing data responses would allow completion of the full set. A data file entry for one child on the Social Skills section might appear as displayed in Figure 7-1, similar to that used in the later stages of analysis in the current study. A similar approach would be required when using the ACHIEVE Assessment in practice.

**Figure 7-1 - Mock data entry example incorporating separate item versions**

| | SS1 | SS2 | SS3 | SS4 | SS5E | SS5P |
|---|---|---|---|---|---|---|
| AA1P | 2 | 3 | 1 | 4 | 99 | 3 |
| AA1E | 3 | 4 | 2 | 3 | 1 | 99 |

Six of the variant items feature within the first three sections of the ACHIEVE Assessment, three of which are included in the Home Activities/Life Skills section and one in each of the School Activities and Community Activities sections. In addition, there is one variant item in each of the Routine & Role and Confidence sections. Finally, there are two variant items within the Social Skills section. However, there are no variant items in the Organisation or Physical Skills section and the remaining 39 items in the other sections are invariant between respondents. Sections 7.4.2 to 7.4.5 include discussion of the variant items as relevant to each ACHIEVE Assessment section and with consideration of the influence of context.

There are potential explanations for the difference in item function between parents and teachers. Each setting in which children engage exhibits genuine differences in the environmental demands placed on their activity performance (Bult et al. 2013, Anaby et al. 2014). Therefore, the varying ease with which each respondent endorses an item may reflect the environmental demands of the setting in which they are responsible for the child. Although participation is one construct, it is widely recognised as being multifactorial and context dependent (Fauconnier et al. 2009, Maxwell et al. 2012, Raghavendra 2013). Indeed, context sets participation apart from performance capacity (Maxwell et al. 2012).

In addition to context, the parent-child relationship differs from the teacher-child relationship, thus altering the perspective of each respondent. Kersten et al. (2016), in their review of psychometric qualities of the Strengths and Difficulties Questionnaire (SDQ), suggest that in such instances, the interest is not inter-rater reliability, but cross-informant consistency. When two respondents differ in their role or relationship to a child, it is not expected that they will rate them in the same way (Kersten et al. 2016).

However, the variance between respondents does have implications for measurement, as it is not possible to quantitatively compare parent and education responses on items exhibiting DIF without compromising the data. Any difference in score may result from the different function of the items, rather than differences in perception or children's actual participation. For example, a high score on item LA1 "Cleans self after toilet…" which is relatively easy for teachers to endorse, would not necessarily be equivalent to a high score for parents. However, although there are 10 variant items, the remaining 39 remain invariant, thus allowing useful comparison across a majority of items on the ACHIEVE Assessment questionnaires. Section 7.5 further discusses implications of the differences between parent and teacher reporting of children's participation. The following section discusses analysis of ACHIEVE Assessment dimensionality following alterations made for variant items.

### 7.3.4 Fit Statistics and Dimensionality

Existing literature recognises the complexity of conceptualising participation (Hoogsteen and Woodgate 2010, Granlund 2013, Raghavendra 2013). Heinemann et al. (2010) question whether it is possible to capture such complexity within a single assessment. To date, most of the available assessments of children's participation were developed using CTT to measure construct validity. However, studies that use Rasch modelling approaches are able to demonstrate the extent to which items on an assessment adhere to a single latent trait. When an assessment exhibits a single latent trait, it is unidimensional, providing opportunities for furthering conceptualisations of a construct.

The participation and environment items on the ACHIEVE Assessment measure two different latent traits. Taken as a whole, the fit qualities of the ACHIEVE Assessment therefore reflect current conceptualisations of participation and environment as distinct constructs (Kielhofner 2007a, World Health Organization 2008). However, grouping the two sets of items therefore does not reflect the requirement for a single latent trait according to true measurement (Andrich 1988). Therefore, after the initial investigations, further analysis treated each item set separately; participation and environment. Similarly, future use of the ACHIEVE Assessment should not amalgamate participation and environment scores as such an approach would compromise the quality of measurement. Section 7.4.6 further explores the conceptual distinction between participation and the environment, in addition to the implications for assessment.

Without the environment section and with respondent variant items treated separately, four items underfit the requirements of the Rasch model. In addition, two items overfit the Rasch model; however, these are less of a threat to measurement and partially influenced by the presence of underfitting items (Bond and Fox 2015). Therefore, given the diversity of children's lives and complexity of participation, expecting perfect fit to a statistical model is unrealistic (Boone et al. 2014). In reality, the aim is not to perfectly match the expectations of the Rasch model, thus inclusion of a small number of misfitting items is acceptable, particularly where their item content is of value (Linacre 2002, Bond and Fox 2015). Sections 7.4.2 to 7.4.5 include consideration of the misfitting items within the context of their overarching item section.

Principal component analysis is a useful adjunct to fit analysis for identifying potential additional dimensions within an assessment (Bond and Fox 2015). There are indications of small additional dimensions within the ACHIEVE Assessment. However, the size of the dimensions and the minimal impact on the overall child measures suggest that there is not enough evidence to warrant creating separate measures (Linacre 2013). There is little available research including investigations of PCA within existing analysis studies, thus the knowledge in this area is limited.

Future work will be useful, particularly in measuring a reportedly multifaceted construct such as participation (Fauconnier et al. 2009, Raghavendra 2013).

In addition to item fit, child misfit indicates the extent to which a respondent does not score items in a predictable manner reflecting the difficulty and spacing of the items relative to child ability (Boone et al. 2014). There are many potential reasons for misfit and, for children particularly, some degree of misfit is not surprising. When examining child fit, any instances of misfit were considered in the context of the child's demographics and scoring pattern to identify whether there was a common theme in the misfitting children that would indicate a discrepancy in the assessment's measurement approach. Indications of child misfit were considered to reflect the nature of the sample and complexity of the construct, thus of less concern than item fit.

The findings therefore demonstrate that, when excluding the environment items, the ACHIEVE Assessment is a unidimensional measure of children's participation and contributory factors. Items from different sections of the ACHIEVE Assessment fit on the same measurement dimension, providing insight into children's participation in different activity types and factors that may support or restrict them in each.

### 7.3.5 Differential Item Function

Examining DIF between distinct groups on the ACHIEVE Assessment is useful for ensuring that measurement does not differ as a function of child characteristics. When an item maintains similar function across groups of children, it ensures that they are being measured against the same 'ruler', thus measuring all children equitably (Wu and Adams 2007, Bond and Fox 2015). If items differ in function between groups, the child measures may not accurately reflect an increase or decrease of the construct as expected (Wu and Adams 2007). Invariant measurement free from instances of DIF therefore also supports comparison between distinct groups, for example comparing the participation levels of boys and girls in certain activities.

Bond and Fox (2015) highlight that indications of DIF are not sufficient in themselves to warrant removing items from an assessment. Instead, indications of DIF should prompt investigation of potential causes, as well as considering the statistical results alongside existing knowledge of the construct of interest. However, it is important to know that differences in children's scores reflect their own ability and not changing item difficulties.

The ACHIEVE Assessment exhibits instances of DIF according to gender, age and reasons for referral. The size of demographic groups within the current study limit the extent to which it is possible to make definitive interpretations in terms of measurement consequences. In addition, the impact of DIF exhibiting items on the total child measures is minimal. Therefore, the DIF detected within the current study is unlikely to be sufficient to cause problems when using the assessment with a similar population of children. However, building upon the findings from the current study in future work would support DIF investigation that is more decisive.

A particular challenge with DIF analysis in the current study is the mixed sample; there is no control group and some of the diagnostic groups show comorbidities. Therefore, there is no opportunity for comparing DIF between a diagnostic group and a TD group. An example of such an approach is the Rasch analysis of the KIDSCREEN, which included a DIF analysis between typically developing children and those with cerebral palsy to determine whether items were suitable for comparison across the two groups (Erhart et al. 2009). Further, combined reasons for referral and comorbidities create complexities when drawing comparisons across groups. For example, some children in the current study have as many as 6 or 7 reasons for referral. Thus, although results from DIF analysis of reasons for referral groups may indicate potential DIF according to diagnosis, it is not appropriate to make decisive conclusions on that basis. Section 7.4.1 includes consideration of instances of age and gender DIF within the context of current understandings of associations between child characteristics and participation.

### 7.3.6 Benefits of Using Rasch Analysis in the Current Study

Rasch modelling was selected instead of CTT as the analysis approach in the current study for reasons of statistical and conceptual relevance. Statistically, applying CTT approaches that assume interval level data to ordinal rating scales creates errors in the analysis. Rasch analysis overcomes this issue by first converting ordinal rating scale responses to interval level data on a logit scale. Although statistically relevant, the application of Rasch analysis to participation assessments has come under scrutiny. Heinemann et al. (2010) argue that, by seeking fit to a statistical model, using Rasch analysis does not reflect the complexity of everyday life. In addition, for a construct as multifaceted as participation, using a statistical model to demonstrate dimensionality using correlational assumptions raises questions. However, existing research demonstrates the successful application of Rasch analysis to participation assessments (Keller and Kielhofner 2005, Bedell 2009).

Within the context of the current study, Rasch analysis usefully demonstrates the distinct measurement dimensions of participation and the environment. After separation of the environment items, Rasch analysis confirmed the measurement qualities of the ACHIEVE Assessment as a unidimensional measure of children's participation. The data conversion and analysis included within Rasch analysis allowed for detailed investigation of parents' and teachers' use of the rating scale, differences in item function and dimensionality of items. In addition, interpretation of item hierarchies supports current developing concepts of participation. The combination of these factors allowed in-depth investigation of the ACHIEVE Assessment as a multifaceted measure of children's participation as reported by their parents and teachers. Rasch analysis also allowed consideration of the varying demands of different types of activity included in the ACHIEVE Assessments.

## 7.4 Conceptualisation of Participation

The following sections integrate discussion about the function of the ACHIEVE Assessment and conceptualisation of participation, using information about item fit and hierarchy. Echoing the structure of chapter 2, the sections discuss child

characteristics (7.4.1), performance skills (7.4.2), volition (7.4.3), habituation (7.4.4) and the environment (7.4.5).

### 7.4.1 Personal Characteristics

Children's own characteristics show associations with their participation (Coster et al. 2013a, King et al. 2013b, Ullenhag et al. 2014). Existing research identifies differences between genders in their participation, particularly within skills-based or active physical activities (Bult et al. 2013, King et al. 2013b). The difference between boys' and girls' participation in certain activities echoes research about associations between gender and activity preferences (King et al. 2013b). In particular, research indicates that boys participate more than girls in physical leisure activities, whereas girls participate more than boys in social and self-improvement activities (Bult et al. 2013, Ullenhag et al. 2014). Due to the association with children's day-to-day participation, gender is therefore an important characteristic that researchers explore for existence of DIF in studies using Rasch analysis (Brown and Unsworth 2009, Chien and Brown 2012).

Although research indicates that there is variance in the actual participation of different groups, ideally measures will remain consistent; item difficulties should not change from one child to the next. Of the included items, only teacher specific item LA3E "Manages own snacks/lunch in school" exhibits DIF according to gender. The item is easier for teachers to endorse when rating boys than when rating girls. However, there is no clear reason for the DIF between genders on this item. There is no significant difference between the percentage of boys and girls referred due to gross or fine motor skills and the mean ages are equivalent, both of which are factors that associate with children's activities of daily living. In addition, cross plots of child measures with and without the DIF item demonstrates strong positive correlation between the two, indicating minimal impact. The large proportion of boys relative to girls in the present study may also partially influence the results.

All other items on the ACHIEVE Assessment maintain consistent function between boys and girls, ensuring that both are measured against the same 'ruler' and creating the possibility of comparison between genders. In addition, comparison of the child

measures on the ACHIEVE Assessment do not indicate any significant differences between boys and girls for parent report, on either the whole assessment or individual subsections. However, when analysing teacher report measures, girls have higher average scores across the whole assessment and on the confidence section.

The differences between boys and girls on the teacher report may reflect existing research about girls having higher participation than boys do in skills-based activities (Bult et al. 2013, King et al. 2013b, Ullenhag et al. 2014). However, as existing research focuses primarily on leisure participation, the findings are not directly comparable. Presenting one of the only studies of children's participation at school, Coster et al. (2013a) do not report investigating associations with gender, instead focusing on age and disability effects.

Age is another personal characteristic of interest within research about children's participation. Although the findings are variable, research indicates an association between children's age and their participation (Bult et al. 2011, Coster et al. 2013a, King et al. 2013b). The variable findings reflect sample populations; for example, inclusion of younger children, adolescents or neither alters whether studies identify an age effect (Anaby et al. 2014, Little et al. 2014, Shikako-Thomas and Law 2015). Age effects are apparent when comparing older and younger children; however, the effect size varies according to activity type (Klaas et al. 2010, King et al. 2013b, Ullenhag et al. 2014). The current study includes children ranging in age from 4 to 17 years old and Rasch analysis demonstrates that the ACHIEVE Assessment targets a wide range of ages. However, the average age of the population skews towards the younger ages, with relatively fewer children over the age of 12.

Given the association with children's participation, age is an area of interest for DIF investigations, in order to support comparisons across groups. The results indicate more instances of DIF according to age group than for gender. There tends to be a pattern of DIF occurring according to the oldest or youngest age groups in the analysis. In particular, the youngest age group, 4 year old children, has more instances of DIF than any other group.

The size and direction of DIF according to age varies between ACHIEVE Assessment sections. There is one instance of DIF within the Home/Life Activities section, three within the School Activities section and two within the Community Activities section that are harder for respondents to endorse when rating 4 or 5 year olds. As the pattern is true of respondent-specific and joint items, the findings may suggest that such activities are harder for younger children, placing demands on still to develop performance skills. In contrast, three items from the Confidence section and one each from the Organisation and Physical Skills sections are easier to endorse when rating 4 year olds.

As with DIF between parents and teachers, it would be possible to analyse the data based on individual age-specific items, however the variable nature and amount of DIF would result in many item versions. Splitting items into different versions for age groups would add to the complexity and, thus, reduce the clinical utility of the ACHIEVE Assessment. In addition, comparison of child measures with and without differentially functioning items indicates minimal impact on the measure from the whole assessment. Thus, although it may not be appropriate to compare performance on individual items, comparison across sections or the whole assessment could still provide useful information. However, the extent of DIF according to children who are 4 years old indicates that the ACHIEVE Assessment should be used with caution with this group. Further, it will be important to disentangle associations between age and participation, in addition to developing approaches to measuring participation across childhood.

### 7.4.2 Children's Participation and Settings

Children's participation varies across types of activities and is influenced by their environments (Anaby et al. 2014). Findings from existing research indicates that the impact that a child characteristic or skill has on participation varies according to activity type, an aspect which is particularly influenced by the setting that a child is in (Mâsse et al. 2013, Kanagasabai et al. 2014). Participation at home, school and in the community is important for children's health and well-being. The following section overviews analysis of each of the setting sections on the ACHIEVE Assessment according to Rasch analysis results.

#### 7.4.2.1 Home Activities/Life Skills Related to School

The first section on the ACHIEVE Assessment relates to children's home activities, or equivalent life skill activities at school. Activities such as using the toilet, managing clothing and managing their food are important for children's day-to-day participation in home and school settings (Shepherd 2015). The Home Activities/Life Skills items are among some of the easiest on the ACHIEVE Assessment item hierarchy. However, the items also cover a wider range than other sections, with item LA6P "Effectively moves between home activities" being among the hardest items to endorse on the whole assessment. The relative ease with which teachers endorse self-care items such as LA1E "Cleans self after toilet at school", LA2E "Manages clothing at school" and LA3E "Manages snacks/lunch at school" partially reflect the item hierarchy on Rasch analysis of COSA (Keller and Kielhofner 2005). According to Keller et al.(2005), items "eat meals" and "dress self" were two of the easiest items for children to endorse on the self-report assessment. The ease with which parents, teachers and children endorse self-care items reflects a practice effect, activities of daily living being recurring features of children's daily routines (Shepherd 2015).

There are more instances of respondent DIF, requiring separate item versions, on the Life Activities section of the ACHIEVE Assessment than any other section. Of the items that differ in function between parents and teachers on the life section, each of the teacher-specific versions is easier than their parent equivalent. Multiple factors may influence the relative difficulty of the parent and teacher-specific versions of these items. In addition to expectations related to the setting, features of the physical and social environment can influence children's participation in self-care activities (Anaby et al. 2014, Shepherd 2015). Parents are more intimately involved in their children's self-care than teachers are and, particularly in instances when time is limited or they perceive their child to be struggling, may be more likely to intervene, reducing children's participation (Soref et al. 2012, Rosenberg et al. 2013a).

#### 7.4.2.2 School Activities

Nursery or school attendance is a major feature of children's lives. Children in Scotland begin attending formal education between 4 ½ and 5 ½ years old, with the option of attending an early learning and childcare centre from age 3 (Education

Scotland 2016). Children's school participation relates to academic activities such as reading, writing and engaging in class projects. However, in addition to academic activities, children's time at school also includes interacting with peers during break times and engaging with structured physical activity during physical education (P.E.) lessons. The variety of activities presented to children during the school day therefore places demands on multiple performance skills sets.

The hardest item on the school activities section is SA2 "Handwriting and shape making". SA2 also exhibits multiple instances of age-related DIF, being significantly harder when endorsing children aged 4 or 5 years old in comparison with the rest of the sample. Handwriting is an important activity for children attending school, one that supports their participation in day-to-day classroom activities, in addition to completing examination procedures (Wallen et al. 2013). Handwriting difficulties are also the third most common reason for referral among children included in the current study, reflected in the difficulty of SA2. Children's handwriting develops as they mature, thus it is unsurprising that parents and teachers are relatively less likely to endorse high scores on SA2 for children aged 4 or 5 years old.

Similar to the Life Activities items, the self-care School Activities items are among the easiest on the hierarchy. The easier endorsability of self-care items may also reflect a practice effect. The hierarchy again reflects that of the COSA, on which items relating to self-care ("Dress self", "Eat meals" and "Body clean") were easier for children to endorse than "Finish homework" and "Finish classwork" (Keller and Kielhofner 2005).

There is one instance of DIF requiring different versions for respondents, SA5 "Organises self to manage routines". However, the DIF reflects the alternate wording of the items, included to avoid duplicity on the education version of the questionnaire of two items relating to children's toileting within the school setting.

#### 7.4.2.3 Community Activities

In addition to home and school activities, community participation provides children with important opportunities for exercise, building relationships and developing a sense of self (Bult et al. 2013, Peny-Dahlstrand et al. 2013, Lauruschkus et al. 2015).

Children's social environments influence their community participation, particularly in the case of family preferences shaping the leisure activities in which children might engage. All of the Community Activities items fit the assumption of the Rasch model, demonstrating that they align well with the underlying trait of the ACHIEVE Assessment.

Having all items below the mean item measure, the Community Activities section is relatively easy for parents and teachers to endorse. In addition, the mean measure of the community section is significantly easier than the performance skills sections, the Confidence and Routine & Role sections. The findings reflect existing research from Rasch analysis of the COSA, on which it is relatively easy for children to endorse the items "Do things with family" and "Do things with friends" in comparison with other activity types. Similarly, Bedell (2009) reports there are three social leisure items on the CASP, the easiest of which is "Home: Social leisure with family" followed by "Home: Social leisure with friends" and then "Community: Social leisure with friends". Engaging with different people in the same environment therefore produces different item measure results, as does engaging with the same people across different environments. There therefore appears to be a social environment and wider setting impact on children's leisure participation.

Examination of unexpected responses to items can provide insight into the cause of misfit, particularly if patterns exist within those responding in an unexpected manner (Linacre 2013). A high proportion of unexpected responses to item CA1 were attributed to parents. This pattern within the unexpected responses reflects the wording of the item, which differed between parents "Your child is able to ride a bike, rollerblade, skateboard, scooter etc." and teachers "Your pupil is able to engage in activities that enable them to participate with their peers after nursery/school (e.g. climbing frames, scooters, bikes)". Although the wording in the education item directs attention towards children's engagement with peers, facilitated by using a scooter etc., the parent version of the item focuses on the physical completion of the activity using the same apparatus.

There is a sense in which parents and teachers responding to item CA1, are answering questions about different aspects of children's participation, which may cause the

misfit. Therefore, the variance reflects conceptualisations of participation as being distinct from simple activity performance (Fauconnier et al. 2009, Maxwell et al. 2012). Removal of the unexpected responses improved the item fit enough to bring it within the parameters of the current study. However, further development of the ACHIEVE Assessment warrants a change to the item wording so that parents and teachers are asked equivalent questions for item CA1. As the version that refers to the context of social engagement, the wording on the teacher questionnaire may be particularly relevant.

Children's contexts provide opportunities for and influence the extent of participation across settings. Each setting within which a child participates presents different types of activities and thus the ease with which parents or teachers endorse high levels of participation varies between home, school and community. Children's participation is widely reported to be associated with a complex interaction of factors. Better understanding how children's participation differs across settings and the interaction with environmental or personal characteristics will enhance the current knowledge base. As an assessment that includes items about children's home, school and community participation, the ACHIEVE Assessment is therefore valuable for use in future work.

The following sections discuss the Rasch analysis findings of each section on the ACHIEVE Assessment within the context of existing knowledge about children's performance skills (7.4.3), volition (7.4.4), habituation (7.4.5) and the environment (7.4.6). The terminology used in the ACHIEVE Assessment differs from the conceptual terminology. Therefore, in the following sections, capitalisation is used when referring to items or sections on the ACHIEVE Assessment (i.e. Physical Skills, Organisation) and normal sentence case when referring to children's performance skills (i.e. motor skills, process skills, social interaction skills).

### 7.4.3 Performance Skills

In addition to personal characteristics and contexts, there is an association between children's performance skills and their participation; interacting with environmental characteristics to influence the frequency and extent of involvement in everyday

activities. Existing research focuses on children's motor skills; however, the findings are inconsistent (Kanagasabai et al. 2014). Recent research also reports associations between children's participation and their social interaction and process skills (Bult et al. 2013, Peny-Dahlstrand et al. 2013, Rosenberg 2015). Few existing studies examine the influence of the three sets of skills together.

Focus on singular sets of performance skills within research studies may reflect the availability of relevant assessments. Existing assessments capture information about children's participation, however then require researchers or clinicians to use additional assessments to understand the effect of personal characteristics or performance skills. Conversely, motor, social interaction and process skills all feature within the ACHIEVE Assessment, allowing identification of those aspects of children's performance skills that support or restrict their participation.

#### 7.4.3.1 Social Interaction Skills

The Social Skills section on the ACHIEVE Assessment includes questions about children's social interaction with parents, peers and teachers. Apart from teacher-specific item SS5E "Asks for support needed at school", all of the Social Skills items fit the Rasch model, demonstrating that the items meet the requirements of a unidimensional assessment as part of the ACHIEVE Assessment. The Social Skills items are spread across a hierarchy of over 1 logit, with the easiest item being SS2 "chatty/sociable and talks with friends", and the hardest item being SS5E "Asks for support needed at school". There is a distinction between the two items; SS5E relating to children's interaction with teachers or support staff, whereas SS2 focuses on children's interactions with friends.

Research repeatedly demonstrates the importance of children's social environments to their participation (Anaby et al. 2014, Lauruschkus et al. 2015). Important features of children's social environments include whom they are with in a particular setting and their relationship with those people (King et al. 2013b, Anaby et al. 2014). Interaction with friends, assuming there is peer acceptance, holds particular enjoyment for children (King et al. 2013b) which may contribute to SS2 being an

easier item to endorse than one which primarily involves interaction with school staff.

In addition, for each of the respondent-specific items, it is the teacher version that is harder than the parent version. SS5E "Asks for support needed at school" and SS4E "Understands others' feelings at school" are harder to endorse than the equivalent parent versions. Although the items are designed to measure the same social interaction skills, the endorsability changes across respondent which points to environmental characteristics within settings changing the demands of a particular activity.

In their study investigating children's school participation, Coster et al. (2013a) report that 44.3% of parents of elementary school children identify social demands of activities making participation harder for their child. In contrast, up to 58.9% of parents report that peer relationships either support participation at school or are not an issue (Coster et al. 2013a). Further, in a study featuring the same sample as Coster et al.'s study, Law et al. (2013) identify that less than 30% of parents report that social demands of an activity make participation harder and less than 20% perceive relationships with family members as being a support to home-based participation. The different ease of endorsability between Social Skills items therefore seems to reflect previously reported differences in the impact of social environments between settings. However, the different perspectives of parents and teachers may also influence their rating of children's social interaction skills.

#### 7.4.3.2 Motor Skills

Kanagasabai (2014) warns about inconsistency in existing research about children's motor skills. Discrepancies between research studies exist due to variability in the measurement strategy, participation focus and sampling approaches that researchers use. In addition, interchangeable use of language referring to motor skills (including motor function, physical skills and physical function) creates further confusion. Association or effect between children's motor skills and participation further varies according to activity type and setting, thus which is the focus will influence results.

Environmental characteristics also change activity demands as children move between settings, altering the association with motor skills.

Physical Skills section items on the ACHIEVE Assessment exhibit item measures at the upper and lower ends of the full hierarchy, indicating a range of ease with which parents and teachers endorse high scores. The hardest Physical Skills item is PS1 "Is not clumsy during activities", closely located with PS4 "Has adequate physical dexterity" which reflect the greater skills demand of these items. The easiest item to endorse is PS5 "Does not fatigue during activities". Although easy in the context of the Physical Skills section, the difficulty of PS5 relative to the whole assessment may indicate the relevance of its inclusion within participation investigations.

However, PS5 also exhibits underfit to the Rasch model, indicating that parent and teacher responses are unpredictable (Linacre 2002). Fatigue may be a characteristic that affects participation differently to others, thus causing the item to exhibit different fit to the Rasch model. Parents of children with Down Syndrome indicate that fatigue is a factor that affects their children's participation (Lyons et al. 2016). However, little existing research has reported whether fatigue is associated with participation or, if it is, the extent of effect. As including a small amount of misfitting items in an assessment is acceptable, the decision was taken to maintain this item in order to support comprehensive measurement of factors associated with children's participation. Including an item about fatigue within the ACHIEVE Assessment would therefore support further research in this area. However, the misfit of this item indicates that some children with otherwise high scores on the ACHIEVE Assessment get low scores on the fatigue item. Care will need to be applied when interpreting scores based on this item.

The Physical Skills section is one of two that does not exhibit any DIF according to respondent; items are not significantly and meaningfully harder or easier for either respondent to endorse. In recent research, up to 44.3% of parents report that physical demands of an activity makes participation harder at school, (Coster et al. 2013a) and 43% report physical demands having the same effect at home (Law et al. 2013). The demands that particular activities place on children's motor skills and thus participation may therefore remain equivalent across settings. However, existing

research indicates that the association between children's motor skills and their participation varies between activity types, which points to changing activity demands (Kanagasabai et al. 2014, Shikako-Thomas and Law 2015). The equivalent function of all Physical Skills items across respondents may indicate that the setting has less of an influence on children's motor skills than on their social interaction skills.

#### 7.4.3.3 Process Skills

Process skills are important for children's participation in all activity types. Rosenberg et al.'s study in 2013 was among the first to include process skills when investigating predictors of children's participation (Rosenberg et al. 2013a). The available research indicates that process skills are an important predictor of children's participation, having stronger associations than factors highlighted within other studies (Rosenberg et al. 2013a). Liberman et al. (2013) indicate that process skills are acquired skills that can be taught and improved through intervention. Therefore, given their strong association with participation and the relative difficulty with which parents and teachers endorse process skills in the current study, process skills are an important area for further work.

The "Organisation" section on the ACHIEVE Assessment, which represents children's process skills, is the hardest section of items. Items OR3 "Works out problems if stuck" and OR2 "Maintains concentration" are the two hardest items on the whole assessment hierarchy. An item relating to problem solving on the SCOPE and items about maintaining focus on activities and problem solving on the COSA are also among the hardest to endorse items on those assessments (Keller and Kielhofner 2005, Bowyer et al. 2007). There are slight differences in the ordering of items at the most difficult end of the hierarchy between the three assessments, which likely reflect the different perspectives; parent/teacher, child and therapist. However, the overall pattern of Organisation items being difficult to endorse across all three studies indicates the particular challenge they create for children's participation.

None of the items underfit the Rasch model; however, OR4 "Follows through instructions" overfits the model according to the parameters selected for the current

study. Linacre (2002) stipulates that overfit is less of a concern, indicating that responses are more predictable than expected. In addition to the one overfitting item, all of the Organisation items have a tendency towards predictable responses; as overall child ability increases, so does the probability of high scores on the items (Bond and Fox 2015). Thus, given the difficult endorsability of these items, capturing information about children with higher participation, and the lesser concern of overfit, it was appropriate to maintain these items within the ACHIEVE Assessment. The difficulty of Organisation items in the current study and strong association with participation in the few existing studies emphasise the importance of addressing children's process skills.

### 7.4.4 Volition

Volition is a key influencer of children's participation, as children's preferences and their self-concept shape their motivation (Goltz and Brown 2014, Imms et al. 2016). Research indicates that children choose to participate in activities in which they feel competent (Goltz and Brown 2014, Mei et al. 2015). There is also an association between children's age, gender and preferences, which King et al. (2013b) suggest influences the interaction of the same with participation. There is no section on the ACHIEVE Assessment that addresses children's preferences, apart from the initial open questions which ask parents and teachers to identify aspects of participation in which children want to improve. However, the hierarchy of ACHIEVE item measures may reflect associations between children's participation and preferences.

The community activities items are among the easiest for parents and teachers to endorse. The community activities items include questions about children's leisure participation, which may be more enjoyable for children and thus increase their motivation. However, the ease with which parents and teachers endorse Community Activities items may also reflect adults' own preferences influencing children's day-to-day activities (Anaby et al. 2012, Mâsse et al. 2013). The different ease of endorsability between Social Skills items may also indicate different enjoyment of each social interaction.

Beyond preferences, existing research indicates that children's confidence, including self-concept, is important for their participation. Children's self-concept is associated with their participation choices and frequency (Poulsen et al. 2011, Goltz and Brown 2014). The confidence items on the ACHIEVE Assessment are among the hardest items on the hierarchy of Rasch calibrations. However, items from other 'WHY' sections on the ACHIEVE Assessment locate closely with confidence items on the item hierarchy. The hierarchy may therefore indicate that children's confidence in their abilities and motivation to persist through challenges is associated with a perceived increase in performance skills. In addition, all but one of the items fit the Rasch requirements, indicating that the confidence items align with the ACHIEVE Assessment underlying dimension.

The variance between respondents on CO4 "Tells ___ what wants to get better at" may reflect an effect of the social environment, which existing research highlights as having an important influence on children's participation. In the case of this item, the relationship that a child has with each of the two respondents is different, thus altering the social environment from one of close familiarity at home. As such, the same activity may be harder for children to engage with at school than at home. The variance in item difficulty between parent and teacher reflects a similar pattern of DIF on the Social Skills items.

In addition to item function differing according to respondent, the confidence sub-section on the ACHIEVE Assessment has only a weak association between parent and teacher report. The weak association may indicate that children's self-concept differs between home and school settings. However, Shashi et al. (2013) also found weaker associations between parent and teacher report of children's internalising social-behavioural symptoms than externalising features. The weak association may therefore reflect differences between the child and each respondent, parents having a closer relationship and thus more intimate insight into children's self-concept. As with other items and sections on the ACHIEVE Assessment, the effect likely reflects an interaction of multiple factors; activity demands, social environment and respondent perceptions.

### 7.4.5 Habituation

Reflecting widespread use of ICF as a conceptual basis within participation research, there is little direct reference to habituation within studies investigating children's participation (Imms et al. 2016). The Routine and Role section on the ACHIEVE Assessment captures aspects of children's habituation by providing information about their engagement with responsibilities to fulfil their day-to-day roles within home and school settings.

Items from the Routine and Role section are spread across upper and lower parts of the item hierarchy, although with a smaller range of measures than other sections on the ACHIEVE Assessment. This indicates that, although all the items relate to one dimension, as demonstrated by fit statistics, they capture different amounts of children's habituation relevant to participation. According to the mean measures, the Routine and Role items are, on average, significantly easier for parents and teachers to endorse than the Organisation items and significantly harder than the community activities items.

The hardest Routine and Role item for parents and teachers to endorse is RO1 "Organises routines". In a study using Rasch modelling to analyse the CASP, Bedell (2009) reports that the item "Manage daily schedule" is the hardest of the CASP, which does not include items designed to capture process skills, thus similarly reflecting the pattern in the ACHIEVE Assessment. The current study sample all attend either nursery or school, thus a large portion of their day is determined by adults in those environments (Anaby et al. 2012, Colver et al. 2012). The difficulty with which respondents endorse item RO1 may therefore reflect the influence of parents and teachers on children's daily routines.

The difficulty of RO1 "Organises routines" and RO2 "Manages multiple responsibilities" in comparison with the easier RO2 "Copes with changed routines" and RO3 "Copes with variety of activities" indicates different performance skills demands for each. Coping with changed routines or a variety of activities still allows for parents' or teachers' influence on children's daily routines. However, the more difficult two items require greater engagement from children to organise their daily

routines, which is more likely to occur as children grow older and the influence of adults lessens (Kielhofner 2007d).

In contrast to DIF on the confidence and Social Skills sections, respondent DIF for item RO4P/E "Understands responsibilities at…" results from being harder for parents to endorse than for teachers. The difference in the ease with which parents and teachers endorse RO4P/E may reflect temporal features of the environment, school presenting children with particular responsibilities within the context of day-to-day routines. The structured school environment may reinforce children's responsibilities more than at home, thus altering how easy it is for children to understand their responsibilities within each environment.

In summary, Rasch analysis of the 'WHY?' sections of the ACHIEVE Assessment further highlight the complexity of children's participation. Each section on the assessment, and individual items within sections, spread across the full hierarchy of item difficulties. No one section of items is entirely more difficult than other sections. However, the Organisation section of items is more difficult on average. In addition, the extent and direction of difference between those items exhibiting respondent DIF varies across different activity types.

### 7.4.6 Environment

Participation reflects children's contextualised involvement in everyday life across home, school and community settings. Consideration of context distinguishes participation and simple activity performance (Maxwell et al. 2012). In addition, a complex interaction between the child, environment and activity shapes their participation outcomes. The environment is therefore a crucial feature of measurement of and discussions relating to children's participation. The influence of the environment on children's participation is still a developing area of research (Anaby et al. 2014). However, current research indicates parental self-efficacy beliefs, peer acceptance and personal assistant support can all affect children's participation (Colver et al. 2012, Anaby et al. 2014, Mei et al. 2015). In addition to social environment characteristics, features of the physical environment create barriers and supports to children's participation (Anaby et al. 2014).

The ACHIEVE Assessment includes a section of 6 items designed to capture features of children's environments. Examination of the item pathway map and item information tables indicates that 3 of the 6 environment items misfit the Rasch model and, along with a further fourth item, exist on a different latent trait. Although children's participation is a reflection of their interaction with the environment, the environment itself is a distinct construct that researchers often measure individually (Coster et al. 2012, Anaby et al. 2014). Thus, it is unsurprising that the environment items and participation fit different measurement dimensions. The misfit of the environment items is conceptually relevant.

A typical response to instances of misfit is to discard the items in question altogether. Such a response can be an appropriate approach to enhancing an assessment's overall measurement qualities (Bond and Fox 2015). However, the initial misfit of the environment items in the current study reflects conceptual knowledge about distinctions between children's participation and their environment (Coster et al. 2012). In addition, there is an intrinsic link between context and children's participation, thus the environment is crucial to increasing understandings of their participation (Maxwell et al. 2012). Therefore, rather than remove the environment items altogether, the decision was taken to instead determine whether they could usefully gather information as an independent section.

The results indicate that the environment items appropriately fit the Rasch model when analysed separately from the participation items. Thus, the environment items capture a single dimension for the purposes of measurement (Bond and Fox 2015). However, the summary statistics and Wright map highlight that the items are generally too easy for parents and teachers to endorse high scores. Therefore, although representing a single latent trait for the purposes of measurement, the items are not capturing useful information across the whole latent trait (Bond and Fox 2015).

Research and conceptual literature indicates the influence of environmental characteristics on children's participation (Colver et al. 2012, King et al. 2013b, Anaby et al. 2014). Environmental characteristics interact to support or restrict children's participation. Children in the current study exhibit a wide range of measures on the

ACHIEVE Assessment participation items, representing multiple levels of participation. Therefore, assuming that personal characteristics are not the sole determining factors of children's participation (Maxwell et al. 2012), the inclusion of children with low participation would suggest environmental restrictions are present. Bedell (2009) indicates that parents have a useful insight into aspects of the environment that support or restrict children's participation. However, parents in the current study endorse high scores on the environment items, despite the lower scores for children's participation measures.

One potential reason for the relative ease with which parents and teachers endorse the environment items is differences in respondent severity (Streiner 2008, Bond and Fox 2015). Parents and teachers are rating their own environment which may make them reluctant to give lower scores or genuinely perceive the environment they provide for their child to be supportive. Conversely, it may be that parents who are actively participating in their child's care by, for example, completing an assessment such as the ACHIEVE Assessment, are already taking steps to provide supportive environments. Rosenberg (2012) indicates examples of such an occurrence, wherein parents with high self-efficacy beliefs were thought to identify, then attempt to remedy, potential environmental restrictions. However, without having further information about the parents and teachers completing the ACHIEVE questionnaires, it is not possible to determine whether this is an effect present in the current study.

There are many environmental features that can restrict children's participation including negative attitudes, lack of physical access, and poor community resources (Colver et al. 2012, Anaby et al. 2014, Mei et al. 2015). Therefore, six items on the ACHIEVE Assessment is unlikely to capture such a range of environmental features. The superficial representation of the environment on the ACHIEVE Assessment could influence the relative ease with which parents and teachers gave high scores on the environment items. Therefore, adding environment items to the ACHIEVE Assessment would enhance the conceptual relevance of the environment sub section, as well as increasing the precision of measurement.

As parents and teachers rating the environment items do give some lower scores, it is possible to use information in the questionnaires to detect initial problems. However,

decision-making within practice or empirical research would benefit from additional questions that are able to detect strengths and limitations in the more intricate features of the environment that affect children's participation. This might include items that target specific features of the environment that research indicates particularly influence children's participation; for example, peer attitudes, the quality and accessibility of out-of-school activities or parent financial resources (Anaby et al. 2014). Therefore, future work in the area of measuring children's participation would benefit from considering how best to identify such environmental supports and barriers. Undertaking such work would also require fully understanding the intricacies of environmental features that affect participation.

Assessing the environment as relevant to children's participation is not a straightforward task. Firstly, the number and complexity of associated environmental features creates a need for a comprehensive, detailed and potentially extensive approach to assessment (Colver et al. 2012, Anaby et al. 2014). The task relates less to an overall evaluation of the environment, as is currently the case in the ACHIEVE Assessment, and more to which specific features affect children's participation and how they do so. Secondly, the child is constantly acting on and within the environment, there is a two-way interaction between the two (Maxwell et al. 2012). Therefore, there is a challenge in differentiating between measuring the context (environment) rather than the outcome (participation) of the interaction between children and features of their environment.

Therefore, although the ACHIEVE Assessment environment section is unlikely to be sufficient in its current form, it may provide a useful basis for future work. For example, EN4 "Nursery/school staff are available to support your pupil to take part in activities…" might instead be treated as an overarching theme under which are more focused items. Such items could include specific questions about school staff having enough time to provide support, staff being knowledgeable about children's need and/or staff knowing how to provide individualised support. Similar approaches could then be taken for each of the environment items.

In addition to the ACHIEVE Assessment itself providing a basis for further work, the findings from the analysis of the environment items have important implications.

Namely, future attempts at developing environment assessments should seek to include more items than is available in the ACHIEVE Assessment. In addition to having more items, and according to the Rasch model, future assessment would benefit from a selection of items that demonstrate a range of ease of endorsability (Bond and Fox 2015). If these steps are taken to create a comprehensive, conceptually relevant environment assessment, it will support attempts to understand how features of the environment interact with children's personal characteristics and performance skills to determine their participation. Such work in the future is crucial due to the importance of the environment to children's participation.

## 7.5 Parent and Teacher Reports of Children's Participation

The complexity of children's participation necessitates comprehensive, ecological assessment information. Involving parents and teachers in assessment can support gathering information that is an accurate reflection of children's real life participation. Inclusion of parent and teacher questionnaires in the ACHIEVE Assessment provided the opportunity to explore associations between the two respondents in the current study. In addition to instances of item variance between respondents, cross plot analyses indicate only weak to moderate associations between parent and teacher report of children's participation on the ACHIEVE Assessment. Although parent and teacher ratings significantly correlate across the whole assessment and between subsections, the size of correlation was small to moderate. Further, mean child measures on the Life activities, Routine & Role and Physical Skills section differ significantly between respondents.

Few existing participation assessments include information about children at home, school and in the community. Those that do include information about children's school participation do so from the perspective of parents only. It is therefore a unique strength of the ACHIEVE Assessment that it provides a means for gathering information about children's participation across multiple settings and from two respondents. However, the differences in item function and weak association between parent and teacher reports of child measures requires further consideration.

Current research investigating children's participation depends largely on parent report information (Coster et al. 2013a, Anaby et al. 2014). Gathering information from parents is beneficial as they have an intimate, long-term insight into their child's life (Dunlap et al. 2001, Rosenberg et al. 2013b). In addition, parents' emotional commitment to their child may result in an increased interest in their needs and sensitivity to identify any problems that may restrict their participation (Lo et al. 2015). However, their emotional commitment also results in parents having a less objective view of children's participation (Chevignard et al. 2012, Treyvaud 2014). Teachers are therefore a key secondary source of information as they benefit from seeing children engage in a classroom context and over extended periods of time (Jacobs 2012). However, little work has been done to develop strategies for gathering information about children's participation from teachers, which limits the information that it is possible to gather about children's time at school.

The disparity of information about the teachers' perspective reflects the lack of assessments readily available that include their report of children's participation. Review of currently available assessments designed to measure children's participation included 15 that addressed the school or nursery setting, of which two included the teacher's perspective (Phillips 2013). Both of the assessments incorporating the teacher's perspective addressed the school setting only. Therefore, there is little scope for comparison of parent and teacher report of children's participation using previously existing assessments.

There is no research currently available that investigates associations between parent and teacher reports of children's participation. However, studies investigating parent and teacher reports of children's behaviour demonstrates both discrepancies and similarities between the two respondents (Johnson et al. 2014, De Los Reyes et al. 2015). The presence of certain behaviours in one setting but not the other as well as different respondent expectations or emotional biases can all contribute to respondents' reports (Jepsen et al. 2012). As such, there are varying levels of agreement between the respondents in studies including multiple features of behaviour (Jepsen et al. 2012, De Los Reyes et al. 2015). However, some research

reports findings that indicate stronger associations, perhaps due to the specificity of the topic under examination.

Children's motor skills are a key contributor of participation and one of the main reasons why children were referred to services participating in the current study. Lalor et al. (2016) report significant associations between standardised assessments of movement with parent, teacher and child-report of motor skills. Again, the strength of association varies between respondents and across domains (Lalor et al. 2016).

In addition to parents' emotional commitment influencing the way that they report children's participation, further demographic factors may affect their perspectives. Studies indicate associations between maternal education, parental self-efficacy beliefs and children's participation (Anaby et al. 2012, King et al. 2013c, Rosenberg et al. 2013a). Parents have an important influence on children's participation and thus this association reflects that influence. However, studies comparing differences between parent and teacher reports of children's behaviour indicate that such demographics may influence respondent perspectives (Stone et al. 2013). Therefore, it may be that studies indicating an association between parental demographics and children's participation capture respondent perceptions as well as children's participation. Not having demographic information about parents and teachers in the current study reduces the extent to which it is possible to demonstrate whether such an effect is present.

## 7.6 Summary

The purpose of the preceding chapter was to discuss findings from Rasch analysis of the ACHIEVE Assessment within the context of existing literature. The findings indicate that the ACHIEVE Assessment is a quality measure of children's participation; the assessment demonstrates acceptable category function and appropriate targeting to the sample population. With the exception of the environment items, the ACHIEVE Assessment demonstrates acceptable fit to Rasch model assumptions, indicating true measurement of a single latent trait. The environment items better fit the model when separate from the participation items. However, the environment items are relatively easy for parents and teachers to

endorse high scores, thus reducing the possibility of collecting detailed information about environmental characteristics.

In addition to analysing the measurement qualities, examination of the item hierarchy against existing literature and published assessments allowed for further discussion of participation conceptualisations. Findings from the research add to knowledge about the contextual nature of participation. ACHIEVE Assessment items that vary in function between respondents reflect existing knowledge about the influence of the social environment. In addition to performance skills sets, the relative ease with which parents and teachers endorse community items and self-care items points to practice effects and enjoyment. However, the school activities items being harder highlights the importance of increasing research knowledge about children's participation in this setting.

The difficulty of the organisation items, and previous indication of the responsiveness of children's process skills to intervention, highlights the importance of further addressing process skills within research about children's participation. Findings from the current study and existing literature emphasise the complexity of children's participation; rarely is a single personal or environmental characteristic the cause of differences between item function or child performance.

Finally, inclusion of parent and teacher report within the ACHIEVE Assessment allowed for investigation into association between the two respondents. There are only weak to moderate associations between parent and teacher report on the full set of ACHIEVE Assessment items and on individual sections. The findings therefore build upon existing knowledge about the use of multi-informant approaches within behavioural assessment and raise questions about the suitability of gathering information from single respondents when measuring children's participation.

The following, final chapter of this thesis summarises the preceding content in order to identify implications for practice, policy and research. In addition, the chapter outlines strength of the current study, limitations of the current study and directions for future work

# Chapter 8 - Conclusion

Discussions surrounding the appropriate conceptualisation of and response to childhood disability have seen significant change over recent decades. In particular, a change from 'treating' disability at the level of body function to a more ecological approach is shaping healthcare research and practice today. Participation, conceptualised as children's involvement in everyday life, is a priority area within research and is gaining recognition as being the ultimate outcome for healthcare practice. Childhood is a unique period of life that warrants special attention in order to ensure that all children realise the right to participation. Children's participation includes time at home, at school and in the community, each setting presenting opportunities for engaging with different types of activities and people.

Existing research demonstrates the association between children's participation and a complex interaction of contributory factors. There are significant differences between genders in the types of activities in which they participate most; girls participate more in social and skills-based activities while boys participate more in physical leisure activities. There is also an association between children's age and their participation, which partially reflects age-related preferences. In addition to personal characteristics, there is a positive association between children's performances skills, self-concept and participation. Finally, features of the environment including physical accessibility, social attitudes and parent education influence children's participation. The impact of each environmental feature or personal factor depends on the interaction with others. However, much of the existing research focuses on children's leisure participation, with less focus on the home and school settings. There is also less understanding about how each performance skill relates to the other.

The contextual nature of participation and the complexity of contributory factors create challenges for measurement. Ecological assessments that capture children's real life participation are useful in further enhancing knowledge and directing clinical practice in this area. In particular, gathering information from parents and teachers is a useful way of gaining intimate insights that are a true reflection of children's everyday participation. There are growing numbers of assessments available to

measure children's participation. However, few of the existing assessments capture information about children's school participation. Those that do capture information about children's school participation depend on parent report. In contrast, the ACHIEVE Assessment is designed to capture information about children's participation at home, school and in the community, in addition to contributory factors such as performance skills and volition. The ACHIEVE Assessment includes questionnaires that are completed by children's parents and teachers, thus providing relevant and accurate information.

The purpose of the current study was to analyse the measurement qualities of the ACHIEVE Assessment and to use the resulting data to further explore aspects of the complexity of children's participation. Services from across Scotland supported the research by implementing the ACHIEVE Assessment within their standard process of care. Data was collected from questionnaires when parents consented to use of their children's assessment data within the research. Rasch analysis techniques were then used to analyse the measurement qualities of the ACHIEVE Assessment, including fit statistics, differential item functioning and sample targeting. In addition, the item hierarchy provided information about the interaction between children's home, school and community activities and to performance skills, as well as aspects of volition and habituation. Finally, associations and differences between parent and teacher questionnaires were also explored.

The study sample includes 402 children ranging in age from 4-17 years old, with a mean age of 8 years, referred to the participating services for a variety of reasons. Reflecting existing research and governmental statistics, the sample was largely male. Rasch analysis demonstrates that the participation and environment items on the ACHIEVE Assessment do not exist on a single latent trait as required for true measurement. However, once separated from the environment items, the participation items and contributory factors items which form the main part of the ACHIEVE Assessment do fit the underlying assumptions of the Rasch model. In addition to existing on a different latent trait to the participation items, the environment items are too easy for parents and teachers to endorse to be of use in gathering clinically useful information.

Although the parent and teacher questionnaires fit on the same latent trait after removal of the environment items, there are differences in item function between the two respondents. In particular, the self-care items on the ACHIEVE Assessment are easier for teachers to endorse than they are for parents. Conversely, items involving social interaction with either adult are easier for parents to endorse than they are for teachers, potentially indicating a contextual influence. In addition to differences in item function, there is an overall low-moderate association between children's measures on parent and teacher questionnaires. The weak association between respondents reflects a variety of influences, including the different context within which they view the child, their own life or professional experiences and their relationship with the child. Although such differences create challenges for measurement, they indicate the importance of multi-informant reports to understanding the complex interaction of factors affecting children's participation.

Overall, items relating to children's participation in home, school and community activities are easier for parents and teachers to endorse than items about children's performance skills, volition and habituation. Without the contributory factors items there would have been less information to differentiate between children with higher levels of participation, who otherwise would have few items targeted at their level. In addition to existing research about the association between children's performance skills and their participation, the findings therefore emphasise the benefits of measuring the full interaction of factors.

Of all of the items, Organisation items are the hardest for parents and teachers to endorse positively, despite motor difficulties being the most common reasons for referral to the participating services. In addition, the item hierarchy demonstrates that items about children's self-care are the easiest across home, school and community settings, potentially reflecting a practice effect. However, community social activities are relatively easier for parents and teachers to endorse than school activities. Finally, self-care items are harder and volition items easier for both respondents to endorse when rating 4 year old children relative to all other ages.

## 8.1 Implications of the Current Study

The findings demonstrate strengths of the ACHIEVE Assessment as a measure of children's participation and contributory factors. In addition, the instances of differential item function between respondents and weak association between parent and teacher report emphasise the value of using multi-informant assessment to capture the complexity of children's participation. However, the instances of differential function between respondents requires additional steps in analysis to synthesise information from the ACHIEVE Assessment questionnaires.

The current study adds to existing knowledge about the complexity of children's participation, including the interaction of personal features and contextual factors. In addition, the difficulty of the Organisation items highlights the importance of exploring the association between process skills and participation. Understanding the association between children's participation and each type of performance skill will help to direct clinical work and research focusing on improving children's participation.

At a global policy level, documents such as the UNICEF World Report (2013) advocate that every child should have opportunities to enjoy participation in all aspects of life. By further demonstrating the complexity of children's participation and the need for multi-informant assessment, the current study can contribute to further developments in this area. In particular, the ecological nature of the ACHIEVE Assessment could support attempts to measure and understand the impact of disability on children's lives.

## 8.2 Strengths of the Current Study

The clinical sample is a strength of the current study, providing information about the measurement qualities of the ACHIEVE Assessment for the population with which it is intended to be used. In addition, the study is one of the larger pieces of research available investigating children's participation and among a few that includes children with different diagnoses. The nationwide sample also reduces the

potential of locality specific influences and its size enhances the precision of the Rasch analysis estimates.

Using Rasch analysis supported in-depth examination of the ACHIEVE Assessment measurement qualities. Few existing studies using Rasch analysis to evaluate assessments have compared reports from two respondents. Adapting the steps recommended by Wolf and Chiu (1999) provided a novel approach to investigating differences between respondents. Following these steps then allowed accurate comparison of parent and teacher perspectives, free from the influence of differential item function. The results add weight to understandings of the complexity of children's participation and the importance of following a multi-respondent approach to clinical assessment or research measurement.

The inclusion of parent and teacher data is a further strength of the current study and a benefit of the ACHIEVE Assessment. As no assessments, to the author's knowledge, include parent and teacher information about children's participation there has to date been limited opportunity for such investigations.

The current study further emphasises and adds to existing knowledge about the complexity of children's participation. In particular, the study addresses the association between children's participation and contributory factors across home, school and community settings. The study therefore reflects an ecological approach to understanding the interaction between children, their participation and their environment.

## 8.3 Limitations of the Current Study

The study would have benefitted from more detail within children's demographics forms; including information about the severity of any functional difficulty or diagnosis, which previous research indicates is associated with participation. In addition, demographic information about parents and teachers completing the questionnaires would have allowed further investigation into factors influencing the weak association between the two, for example years of teaching experience or level of parental education.

Although the study sample covers a wide age range, the average skews towards younger children. As existing research indicates that an age effect on participation is most evident in specific activity types, overall this may not be a particular issue. However, further analysis of the ACHIEVE Assessment with adolescents would enhance understandings of its suitability for that age group.

## 8.4 Directions for Future Work

**The ACHIEVE Assessment**

DIF analyses in the current study indicate the potential influence of age, and reasons for referral groups on the function of the assessment items. However, the smaller number of younger and adolescent children, as well as the heterogeneous nature of the sample limits the extent to which it is possible to be decisive about inferences from these findings. Although variance between such groups is not unexpected, for the purposes of comparison, assessments should ideally use the 'ruler' or hierarchy of items in the same way for all groups.

Therefore, further development of the ACHIEVE Assessments would benefit from a larger sample of adolescents or younger children (i.e. Nursery aged). Such work would require a more targeted sampling strategy, such as purposive sampling. In the meantime, the assessment remains useful for measurement of children's participation; however, caution should be applied when using the assessment to compare across groups on specific items.

Further to the issue of item function varying between groups, analysis of the environment subsection indicates that it is too easy to endorse, which limits the extent to which these items gather useful information. Therefore, future development of the ACHIEVE Assessment might consider adding items to the environment subsection in order to gather greater depth about supports or barriers affecting children's participation. This work would be most effective if supported by a systematic review of existing literature regarding environmental characteristics that impact children's participation.

**Parent and teacher report of children's participation**

Little work has been carried out previously investigating differences between parent and teacher report of children's participation. Conceptualisation literature and research findings widely acknowledge the influence of the environment on children's participation. Home and school settings differ in their physical environment, social environment and the activities and demands presented to children, resulting in likely differences in children's participation across these settings. However, existing research has primarily used parents as the informants who may have limited insight into children's participation at school. Therefore, the opportunity to compare children's participation across contexts has been limited.

The current study adds to the existing knowledge base regarding discrepancies between parent and teacher report of children's behaviour. Thus, future studies investigating children's participation would benefit from utilising both respondents. In addition to generating greater depth of information, this may provide the opportunity for further disentangling differences in perceptions and genuine interaction effect of children's environments. If such investigations were planned, it would be beneficial to gather additional demographic information about respondents to determine whether particular characteristics affect the way in which parents and teachers measure children's participation.

The differences between parent and teacher report in the current study creates questions surrounding the measurement of children's participation and which perspective to use. Some existing studies have investigated the association between child and parent-report of performance or behaviour; however, it may now be relevant to apply similar approaches to participation assessment. In particular, with some indication that parental factors such as education may influence their perceptions, gathering demographic information about respondents would be useful. However, there would be a need to ascertain how to synthesize such information about children's participation; no existing assessments gather quantitative information from parents, teachers and children.

Disentangling the differences between parent and teacher report, in addition to understanding children's self-report of their participation may further clarify

conceptualisations of the construct. Further, understanding how different settings affect children's participation may support future development work. In particular, understanding how the school environment affects children's participation could support efforts towards creating inclusive school environments.

**Children's participation**

Children's participation at school is a relatively under researched area in comparison to the home and community settings. The current study indicates that school participation activities may be particularly challenging for children. Therefore, further research investigating children's school participation and the association with contributory factors is crucial. Gathering information from children's teachers will be important for such research.

In addition to children's school participation, the association with process skills features less than other types of performance skills in existing research. However, if, as the current study suggests, they are the most difficult type of performance skill it will be important to understand how addressing children's process skills might enhance their participation. Future research will benefit from including consideration of all of the performance skills in order to determine which is the most important for participation.

Finally, the study indicates that participation in a variety of activities is more challenging for younger children. Understanding the factors that make those activities more challenging will ensure that younger children are better able to realise the right to full participation in life.

Ultimately, fully understanding the complexity of children's participation will benefit from capturing and disentangling the interaction between contributory factors. Such work is likely to require the use of ecological assessments and large study samples in order to ensure comprehensive, accurate information useful for analysis.

## 8.5 Summary

Children's right to participate in all aspects of life is a global priority and the ultimate outcome for paediatric healthcare. The current study presents findings from analysis

of the ACHIEVE Assessment, an ecological assessment of children's participation. The study demonstrates that, once the environment items are removed, the participation and contributory factors items on the assessment exist on the same latent trait and are useful for measurement. Further work should address the insufficiency of the environment items. The findings of the study also emphasise the complexity of children's participation and the importance of gathering information that provides insights into the full interaction of contributory factors. When this knowledge is gained and its implications seen within policy and practice, the global aim to see all children participating in all of life may become closer to realisation.

| Name and Citation | Reviewed in articles | Target group | Age Range | Respondent | Format | Setting | Number of items | Research article |
|---|---|---|---|---|---|---|---|---|
| APCP (Assessment of Preschool Children's Participation) | (Rainey et al. 2014) | With and without disabilities | 2 - 6 years | Parent | Paper-based questionnaire, includes drawings of everyday activities | Home Nursery Child-care | 45 | Y |
| APS (Assistance to Participate Scale) | (Chien et al. 2014b, Chien et al. 2014a) | With disabilities | 5 - 18 years | Parent / caregiver | Paper-based questionnaire | Home Community | 8 | Y |
| ASK-P (Activity Scale for Kids - Performance) | (Phillips et al. 2013, Chien et al. 2014a) | Physical disabilities caused by neuromuscular disorders | 5 - 15 years | Child | Self-administered questionnaire, parents of children under 9 can read the questions | Home Community | 30 | Y |
| CAMP (Caregiver Assessment of Movement Participation) | | Motor problems | 5 years and up | Parent / caregiver | Questionnaire | Home | 35 | Y |
| CAPE/PAC (Children's Assessment of Participation and Enjoyment) | (Ziviani et al. 2010, Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a, | With and without disabilities | 6 - 21 years | Child - with or without assistance | Self-administered or interviewer-administered questionnaire | Home. Community | 55 in each part | Y |

| Name and Citation | Reviewed in articles | Target group | Age Range | Respondent | Format | Setting | Number of items | Research article |
|---|---|---|---|---|---|---|---|---|
| | Rainey et al. 2014) | | | | | | | |
| CAQ (Community Activities Questionnaire) | (Phillips et al. 2013) | With and without disabilities | 2 - 5 years | Parent / caregiver | Paper-based questionnaire | Community | | N |
| **CASP (Child and Adolescent Scale of Participation)** | (Ziviani et al. 2010, Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a, Rainey et al. 2014) | **Acquired brain injury** | **3 - 22 years** | **Parent or youth version** | **Paper-based questionnaire** | **Home School Community** | **20** | **Y** |
| Child Engagement in Daily Life measure | | Cerebral palsy | Up to 6 years | Parent | Questionnaire | Home Community | 18 | Y |
| CHORES (Children Helping Out: Responsibilities, Expectations and Supports) | (Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a) | With and without disabilities | 6 - 11 years | Parent / caregiver | Paper-based questionnaire | Home | 33 | Y |
| CLASS (Children's Leisure Assessment Scale) | (Chien et al. 2014b, Chien et al. 2014a) | With and without disabilities | 10 - 18 years | Child | Questionnaire | Home Community | 30, 5 open ended questions | Y |

| Name and Citation | Reviewed in articles | Target group | Age Range | Respondent | Format | Setting | Number of items | Research article |
|---|---|---|---|---|---|---|---|---|
| **COSA (Child Occupational Self Assessment)** | | **With and without disabilities** | **8 - 13 years** | **Child** | **Paper checklist or card sort** | **Home School Community** | **25** | **Y** |
| **CPQ (Children Participation Questionnaire)** | (Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a) | **With and without disabilities** | **4 - 6 years** | **Parent / caregiver** | **Paper-based questionnaire** | **Home School Community** | **44** | **Y** |
| FOCUS (Focus on the Outcomes of Communication Under Six) | | Speech and language impairments | Up to 6 years | Parent | Questionnaire or interview | Home Community | 50 | Y |
| FPQ (Frequency of Participation Questionnaire) | (Phillips et al. 2013) | Cerebral palsy | 8 - 12 years | Parent / caregiver | Paper-based questionnaire | Home School Community | | N |
| ICF-FAS (ICF Functional Assessment Scale) | (Phillips et al. 2013) | Hearing impairment | 6 - 14 years | Parent / caregiver and/or teacher | NS | | | N |
| LAQ-CP (Lifestyle Assessment Questionnaire - Cerebral Palsy) | (Phillips et al. 2013) | Cerebral palsy | 3 - 10 years | Parent / caregiver | Paper-based questionnaire | NS | 46 | Y |
| LAQ-G (Lifestyle Assessment Questionnaire - | (Phillips et al. 2013) | With and without disabilities | 5 - 7 years | Parent / caregiver | Paper-based questionnaire | Home Community | 53 | Y |

| Name and Citation | Reviewed in articles | Target group | Age Range | Respondent | Format | Setting | Number of items | Research article |
|---|---|---|---|---|---|---|---|---|
| Generic) | | | | | | | | |
| **LIFE-H (Assessment of Life Habits for Children)** | (Ziviani et al. 2010, Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a, Rainey et al. 2014) | **With disabilities** | **5 - 13 years** | **Parent / caregiver** | **Questionnaire or interview** | **Home School Community** | **197 (long) or 64 items (short)** | **Y** |
| LPS-C (The Life Participation Scale for Attention-Deficit/Hyperactivity Disorder (ADHD)-Child Version) | | ADHD | 6 - 17 years | Completed by interviewer asking parent /caregiver questions | Interview scale | Home Community | 24 | Y |
| M2P1 (Mayo-Portland Participation Index Rating Form)- subscale from Mayo-Portland Adaptability Index | (Ziviani et al. 2010) | Acquired brain injury | Adults with guidelines for use with children | Child or parent, multiple respondents is preferable | Self-administered questionnaire | Home Community | | Y |
| National Survey of Schools and Environment | (Phillips et al. 2013) | With disabilities | 5 - 18 years | School teacher | Paper-based questionnaire | School | | N |

| Name and Citation | Reviewed in articles | Target group | Age Range | Respondent | Format | Setting | Number of items | Research article |
|---|---|---|---|---|---|---|---|---|
| **PACS (Paediatric Activity Sort Cards)** | (Chien et al. 2014b, Chien et al. 2014a) | **With and without disabilities** | **5 - 14 years** | **Child** | **Interview-based using sort cards** | **Home School Community** | **75** | |
| PADL (Participation in Activities of Daily Living) | (Chien et al. 2014b, Chien et al. 2014a) | Chronic or acute health conditions | 6 - 18 years | Child | Interview | Home School Community | 12 | N |
| PCPQ (Pediatric Community Participation Questionnaire) | (Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a) | With disabilities | 8 - 20 years | Child | Questionnaire, can be administered by interview | Community | 19 | Y |
| **PEM-CY (Participation and Environment Measure - Children and Youth)** | (Phillips et al. 2013, Chien et al. 2014a, Rainey et al. 2014) | **With and without disabilities** | **5 - 17 years** | **Parent / caregiver** | **Web or paper-based questionnaire** | **Home School Community** | **25 participation items** | **Y** |
| **PICO-Q (Participation in Childhood Occupations Questionnaire)** | (Chien et al. 2014b, Chien et al. 2014a) | **With and without disabilities** | **6 - 10 years** | **Parent / caregiver** | **Paper-based questionnaire** | **Home School Community** | **22** | **Y** |
| PIP (Pediatric Interest Profile) ALIP (Adolescent Leisure Interest Profile) | (Phillips et al. 2013) | With and without disabilities | 12 - 21 years | Child | Self-administered questionnaire | Home Community | 83 | |

| Name and Citation | Reviewed in articles | Target group | Age Range | Respondent | Format | Setting | Number of items | Research article |
|---|---|---|---|---|---|---|---|---|
| PIP (Pediatric Interest Profile) Kid Play Profile | (Phillips et al. 2013, Chien et al. 2014a) | With and without disabilities | 6 - 9 years | Child | Paper-based questionnaire | Home Community | 50 | |
| PIP (Pediatric Interest Profile) Preteen Play Profile | (Phillips et al. 2013, Chien et al. 2014a) | With and without disabilities | 9 - 12 years | Child | Paper-based questionnaire | Home Community | 59 | |
| PLA (Participation in Life Activities Scale) | | Children with asthma | 9 - 15 years | Child | Paper-based questionnaire | NS | Child selects 1-5 activities, then asked 3 questions about each. | Y |
| Preschool ACS (Preschool Activity Sort Cards) | (Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a) | With and without disabilities | 3 - 6 years | Parent / caregiver | Interview | Home Nursery Community | | N |
| **QYPP (Questionnaire of Young People's Participation)** | (Rainey et al. 2014) | **With disabilities** | **14 - 21 years** | **Parent or young person** | **Self-administered questionnaire** | **Home School Community** | **45** | **Y** |
| **SCOPE (Short Child Occupational Profile)** | (Ziviani et al. 2010) | **With disabilities** | **Birth to 21 years** | **Therapist** | **Information gathered from observation, discussion and records** | **Home School Community** | **25** | **Y** |

| Name and Citation | Reviewed in articles | Target group | Age Range | Respondent | Format | Setting | Number of items | Research article |
|---|---|---|---|---|---|---|---|---|
| SFA (School Function Assessment) | (Ziviani et al. 2010, Phillips et al. 2013, Chien et al. 2014b, Chien et al. 2014a) | With and without disabilities | 5 - 12 years | School teacher and/or health professional | Observation and completion of test-booklet | School | 266 | Y |

| Name | Content validity evidence | Validity analysis results | Reliability analysis results | Rasch analysis results |
|---|---|---|---|---|
| CASP | Literature review and feedback from professionals and families/caregivers of children with and without ABI | Convergent validity: Moderate to good correlation with Pediatric Evaluation of Disability Index (PEDI) - r = 0.72<br>Significant correlations in expected directions with CAPE and CASE. Differentiates between children with different types of disability.<br>PCA = 3 conceptually similar factors or both versions that contributed to 44% variance in youth and 65% variance in parent report<br>Convergent analyses - ICC = 0.63, 95% CI = 0.41-0.75 - agreement between parent and youth report<br>t-test analysis - youth report version significantly higher<br>Moderate ICC agreement, significant t-test differences between versions on all 4 subscores. | Test-retest reliability - parent (ICC):<br>Overall = 0.94.<br>By item = 0.67 - 0.81<br>Internal consistency (Cronbach's alpha): youth = 0.87 parent = 0.95<br>Internal consistency for factor subscales ranged from 0.67 (youth) to 0.90 (parent) | Construct: factor and Rasch analysis - unidimensional. |

| Name | Content validity evidence | Validity analysis results | Reliability analysis results | Rasch analysis results |
|---|---|---|---|---|
| COSA | | | | Competence: all items fit Rasch model, with positive point-biserial correlation coefficients range from 0.30 to 0.53. Item separation index = 6.18, translates to 8.57 strata. Item separation reliability = 0.97. 11.75% children did not meet fit statistics. Person separation reliability = 0.83.<br>Values: 24/25 items fit Rasch model, all had positive point-biserial correlation coefficients ranging from 0.42 to 0.61. Item separation index = 3.96, translates to 5.6 strata. Item separation reliability = 0.94. 15.3% children did not meet fit statistics.<br>Misfitting items relevant to purpose of assessment tool. |
| CPQ | Based on an existing professional framework. Reviewed by 9 experts (clinicians and researchers). | Construct validity - homogeneity 0 moderate to high significant correlations between subsets apart from two low correlations with ADL subscore. Supports homogeneity. Group and age differences - two-way ANOVA - no significant interaction effect. Group and income differences - significant | Internal consistency (Cronbach's alpha): Overall scores = 0.79 - 0.90 Intensity by task domain - 0.45 - 0.70 Independence by task domain = 0.64 - 0.79 Enjoyment by task type = 0.63 - 0.78 Satisfaction by task type = 0.62 - 0.78<br>Test-retest reliability (ICC) : Overall | |

| Name | Content validity evidence | Validity analysis results | Reliability analysis results | Rasch analysis results |
|---|---|---|---|---|
| | Pilot tested with 20 parents of children with and without disabilities. Parents confirmed relevance of items to children's life. | interaction effect between group and family income on diversity measure. Convergent validity - partially supported. Divergent validity - partially supported. | scores: 0.84 - 0.89 | |
| LIFE-H | Adapted from the adult version then reviewed by expert panel of 29 parents, therapists and teachers. | Criterion validity - significant correlations with related domains of PEDI and Wee-FIM Construct validity - compared with PEDI (Pearson's correlation coefficient) - Daily activities, functional skill r=0.44-0.88, caregiver assistance r=0.32-0.88. Social roles, functional skills r = 0.50-0.80, caregiver assistance r=0.44-0.76 | Internal consistency: Daily activities = 0.84 Social roles = 0.81 (2002) Inter-rater reliability (ICC): Daily tasks = 0.80 - 0.93 Social roles = 0.63 - 0.91 Intra-rater reliability (ICC): Daily tasks = 0.83 - 0.95 Social roles = 0.58 - 0.92 Test-retest reliability >0.60 for accomplishment (2002) | |
| PACS | Item validation and development undertaken with children and parents. | Clear differences in patterns among children of different ages. | Parent-child agreement: 86% - 96% | |
| PEM-CY | Reviewed by panel of researchers, practitioners and parents | Construct validity: Two-way ANOVA - significant effect of disability across all settings and all variables, consistent with age interval. Significant age group effect for involve home and school, not community. No significant interaction effects. | Internal consistency (Cronbach's alpha): Frequency = 0.59 - 0.70; Involvement = 0.72 - 0.83; Environment scales = 0.80. Environment >0.79 for all but two scales (Home-supportiveness=0.67, School-resources = 0.73) | |

| Name | Content validity evidence | Validity analysis results | Reliability analysis results | Rasch analysis results |
|---|---|---|---|---|
| | | Significant negative correlations between 'desire for change' and 'environmental supportiveness' | Test-retest (ICC): Frequency = 0.58 - 0.84 Involvement = 0.69-0.76 Desire for change >0.75 Environment scales >0.80 | |
| PICO-Q | Developed with input from parents and professionals. | Construct validity: mean scores for children with SMD significantly lower than those for children without SMD on all except 3 items. SPP total scores correlated with performance level (r = 0.66, p<0.0001) and degree of enjoyment (r = 0.50, p = 0.001) scores but not frequency of performance (r = 0.30, p = | Internal consistency (Cronbach's alpha): performance level = 0.86, degree of enjoyment = 0.89, frequency = 0.86 Test-retest Reliability: performance level r= 0.83, p<0.001; degree of enjoyment r = 0.86, p><0.001; frequency r = 0.69, p = | |
| QYPP | Based on existing measures, expert content review and field testing. | Construct validity: Spearman's p: D = -0.17 (non-significant), B = -0.33 (p<0.05 with one tailed test), A = -0.79, C = -0.46, E = -0.58, F = -0.66, G = -0.50 (p><0.01 with a one tailed test)> Content validity, scale level index: A = 95.5%, B = 95.7%, C = 88%, D = 98%, E = 95.3%, F = 95.5%, G = 86% | Internal consistency (Cronbach's alpha): A Home life = 0.83, B Getting on with people = 0.75, C Educational life = 0.49, D Work life = 0.80, E Recreation and leisure = 0.63, F Autonomy = 0.86, G Preparing for the future = 0.61 Test-retest reliability (ICC): A = 0.83 (95%CI 0.95-0.99), B = 0.96 (95% CI 0.93-0.98), C = 0.83 (95% CI 0.67-0.91), D = 0.92 (95% CI 0.87-0.96), E = 0.91 (95% CI 0.84-0.95), F = 0.98 (95% CI 0.97-0.99), G = 0.90 (95% CI 0.82-0.94) | |

| Name | Content validity evidence | Validity analysis results | Reliability analysis results | Rasch analysis results |
|---|---|---|---|---|
| SCOPE | | | | Rating scale categories: all MnSq<2.00, ordered thresholds and average measures. Unequal frequency of category use.><br>Items: 24/25 items met fit criteria MnSq<1.4 with ZStd of ><2 ><br>Clients: Mean Infit MnSq = 1.09, ZStd = 0.2 - adequate measurement of persons. Client separation index 3.07, r = 0.90 translates to 6 strata.<br>Therapists: two misfitting therapists. Overall rater separation = 1.34, r= 0.64<br>Study 2 - Practitioner separation index = 3.32, r = 0.83. Two misfitting practitioners - represent 5.1% total group, only 0.1% greater than expected 5% misfit.<br>Item separation index = 11, r = 0.99.<br>Four highest level items represented different MOHO construct, three of four lowest level items represented same MOHO construct (environment).<br>Halo effect: three of four |

| Name | Content validity evidence | Validity analysis results | Reliability analysis results | Rasch analysis results |
|---|---|---|---|---|
| | | | | overfitting practitioners from same practice site but using different combination of method of learning administration. None of the underfitting practitioners gave client same rating for all items. Restriction of usage: F = 27%, A = 40%, I = 24%, R = 9% - suggests possible restriction of usage. Chi-square test indicates differentiation between clients with different levels of participation. Client-separation index = 6.09, r = 0.95. |

South East Scotland Research Ethics Service

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NHS Lothian

Name: Kirsty Forsyth
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Date: 03/12/2012
Your Ref:
Our Ref: 12/SS/0230
Enquiries to: Alex Bailey
Direct Line: 0131 465 5679
Email: alex.bailey@nhslothian.scot.nhs.uk

Dear Kirsty,

**Project Title: Properties of the ACHIEVE Assessment v1**

You have sought advice from the South East Scotland Research Ethics Service on the above project. This has been considered by the Scientific Officer and the Chair of South East Scotland REC 02 you are advised that, based on the submitted documentation (email correspondence, Checklist.pdf, Covering letter on headed paper.pdf, Demographics form.pdf, EDUCATION Questionnaire 2012.pdf, Letters of invitation_information sheet__consent form.pdf, PARENT Questionnaire 2012.pdf, QMU 2012-13 Confirmation of Insurance.pdf, REC application form (signedauthorised).pdf, Research protocol or project proposal.pdf, Summary CV for Chief Investigator (CI).pdf), it does not need NHS ethical review under the terms of the Governance Arrangements for Research Ethics Committees (A Harmonised Edition). The advice is based on the following:

- *The project is an study using only anonymised data obtained as part of usual care, but note the requirement for Caldicott Guardian approval for the use or transfer of person-identifiable information within or from an organisation*

**If this project is being conducted within the NHS you should contact the relevant local Quality Improvement Team(s) who will inform you of the governance procedures required before the study commences**

This letter should not be interpreted as giving a form of ethical approval or any endorsement of the project, but it may be provided to a journal or other body as evidence that ethical approval is not required under NHS research governance arrangements. However, if you, your sponsor/funder or any NHS organisation feels that the project requires ethical review by a NHS REC, please write setting out your reasons and we will be pleased to consider further. You should retain a copy of this letter with your project file as evidence that you have sought advice from the South East Scotland Research Ethics Service.

Yours sincerely,

Alex Bailey
Scientific Officer
South East Scotland Research Ethics Service

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The Scottish Government

Miriam Crowe
Queen Margaret Drive
Edinburgh

**06/06/2014**

Dear Miriam

**Caldicott Guardian - 2014-21 - National Scrutiny Process - Application - ACHIEVE Assessment**

Thank you for your application for consideration by the Caldicott Guardian National Scrutiny Process.

I am pleased to inform you that your application has gained National Approval.

In addition to local approval, National Approval has also been granted. Dr Edward Coyle, as Chair of the NHS Scotland Caldicott Guardian Forum, can (if required) confirm that national approval has been granted for this application.

I hope the project goes well and proves to be useful.

Regards,

George Irvine
Information Assurance Manager
eHealth Division

ST Andrews House, EDINBURGH, EH1 3DG
www.scotland.gov.uk

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## Participant Information Sheet

**ACHIEVE Assessment Evaluation Project**

Queen Margaret University
EDINBURGH

You are being invited to take part in a research study. Before you decide whether or not to take part, it is important for you to understand why the research is being done and what it will involve. Please take time to read the following information carefully. Talk to others about the study if you wish. Contact us if there is anything that is not clear or if you would like more information. Take time to decide whether or not you wish to take part.

**What is the purpose of the project?**

This study aims to test the questionnaires which are used in the Occupational Therapy Service. All families receive these questionnaires as part of their first contact with the service. You (the parent) receive a questionnaire. One of your child's teachers also receives a questionnaire. Our research project is to improve the questionnaire. The information we get from you will help refine the questionnaire (e.g. check if we have all the necessary questions, of if any of the questions are unnecessary).

**Why have I been invited to participate?**

You have been asked to take part because your child has been referred to the occupational therapy service.

**Do I have to take part?**

No. Is it is completely up to you to decide whether or not we can use your child's questionnaires as part of the research study. Whether or not you decide to take part it will not affect the care your child receives. If agree now, but then then change your mind, you will be able to withdraw from the study without it affecting your child's care in any way. If you do decide to take part you should sign the consent form at the end of this letter.

**What will happen if I take part?**

You should send the completed and signed consent form back with the questionnaire. Sending the consent form indicates that you are happy for us to use your questionnaires in our study.

**What will I have to do?**

If you are happy to take part in the project please complete the attached consent form and return it with your child's questionnaire. Please feel free to get in contact with the researcher to ask more information or discuss this with staff from the occupational therapy service working with your child.

**What are the possible benefits of taking part?**

The questionnaires aim to help us make the right choices about a child's input from the occupational therapy service. If our research shows that the questionnaires are of good quality this means that we can be more confident in providing the right care to children and families. This will potentially improve the service that children receive in the future.

**What are the possible disadvantages and risks of taking part?**

It is not thought that there are any disadvantages.

**What happens when the study is finished?**

At the end of the research we may improve the questionnaires if the research tells us this is necessary. Information that you give will be stored securely at Queen Margaret University, Edinburgh.

**Will my taking part in the study be kept confidential?**
In order to protect your privacy names, dates of birth, addresses, telephone numbers, medical practice details and nursery/school addresses will be physically removed from questionnaires before they are sent to the researchers. This means there will be no way to link the information in the questionnaire with you, your child or your family. You or your child will never be identifiable in any report or publication.

All the information we collect during the course of the research will be kept completely confidential and there are very strict laws which safeguard your privacy at every stage.

All of the people who are involved in the study will be NHS or Queen Margaret University employees who must abide by strict rules on confidentiality and data protection.

**What will happen to the results of the study?**
The study will be written up as a research paper that we aim to publish in an academic journal. We will present our findings at scientific conferences.

**Who is organising the research and why?**
This study has been organised by the ACHIEVE Alliance, which is a collaboration between NHS clinicians and researchers at Queen Margaret University, Edinburgh. The collaboration aims to improve the quality of children's services nationally.

**Who has reviewed the study?**
The study was reviewed by the NHS Scotland Research Ethics Services who stated that full ethical approval was not required. We have been in contact with the Research and Development offices within your NHS locality to obtain permission for the project.

**Further information and contact details:**
If you would like any further information about this project please feel free to get in touch:

ACHIEVE Alliance Project Lead: Miriam Crowe, ACHIEVE Alliance, Firefly Research Team, Queen Margaret University, Edinburgh, EH21 6UU. E: mcrowe@qmu.ac.uk T: 0131 474 0000

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Queen Margaret University
EDINBURGH

**CONSENT FORM – for parent**

**Title of Project:** ACHIEVE Alliance Assessment Evaluation

**Name of Researcher:** Miriam Crowe

Please return this form with your questionnaire if you have read the information sheet and are happy to participate in the research.

If we do not receive this consent form we will not use either the questionnaire completed by yourself or education.

Please initial boxes

1. I confirm that I have read and understand the information sheet dated 2014 (version 2) for the above study. I have had the opportunity to consider the information, ask questions and have had these answered satisfactorily. ☐
2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason, without my child's care or legal rights being affected. ☐
3. I understand that the questionnaire data collected during the study may be looked at by the project researchers at Queen Margaret University. ☐
4. I agree that my questionnaire can be used in the study. ☐
5. I agree that the questionnaire from education can be used in the study. ☐
6. I agree that both questionnaires can be used within work contributing to the fulfillment of a postgraduate research degree. ☐

Your name (please print) _____ Date _____ Signature _____

**Thank you**

One copy to researcher, one to be kept with hospital notes.

**Miriam Crowe**
ACHIEVE Alliance Project Lead
Firefly Research Team
Queen Margaret University
Edinburgh, EH21 6UU
mcrowe@qmu.ac.uk
0131 474 0000

Version 2 - 2014

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**ACHIEVE Assessment Project**
**Demographic information sheet**

Queen Margaret University
EDINBURGH

To be completed by a member of occupational therapy staff and returned to Queen Margaret University

**Reference number** [ ] **Date completed:** ___/___/_____

**1. Age (months)** _____ **2. Gender (please circle)** Male Female Transgender Unknown

**3. School placement (please circle)** Nursery Language class Special school Mainstream

**4. Medical diagnoses (if known)** _____

**5. Source of referral** _____ **6. Date of referral** ___/___/_____

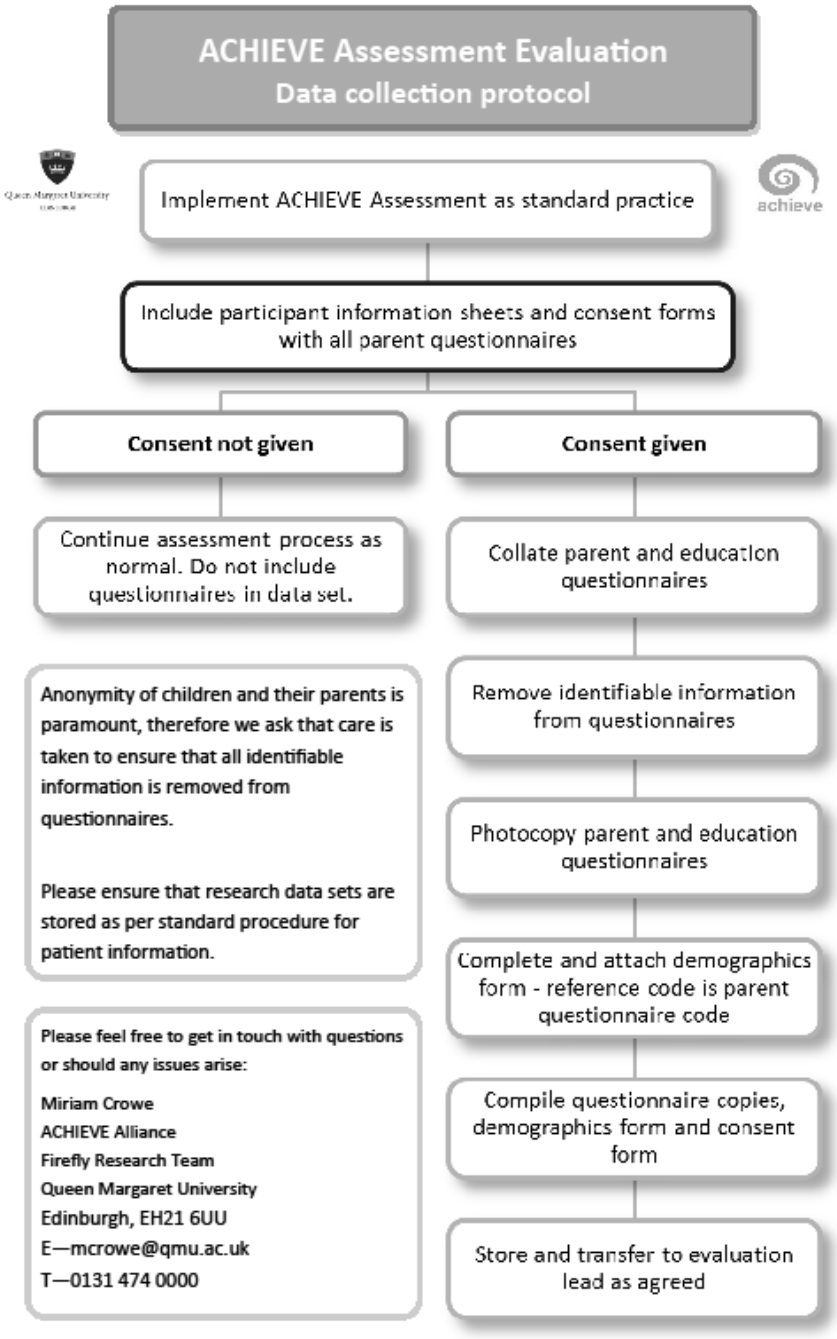
| **7. Reasons for referral (circle all that apply)** | | |
|---|---|---|
| Cerebral palsy ..... 3 | DCD/suspected DCD ..... 1 | Developmental delay ..... 2 |
| Prematurity ..... 6 | Seizures/epilepsy ..... 4 | ASD/suspected ASD ..... 5 |
| Visual/auditory problems ..... 9 | ADHD/suspected ADHD ..... 7 | Learning disability ..... 8 |
| Gross motor difficulties ..... 12 | Behavioural/Mental health ..... 10 | Fine motor difficulties ..... 11 |
| Dressing/washing ..... 15 | Sensory processing ..... 13 | Feeding/drinking ..... 14 |
| Social Interaction ..... 18 | Organisation ..... 16 | Handwriting/drawing ..... 17 |
| | Academic/school ..... 19 | Equipment referral ..... 20 |

| **8. Additional support needs (circle all that apply)** | | |
|---|---|---|
| Motor skills ..... 3 | Learning and mental functions ..... 1 | Communication ..... 2 |
| Vision ..... 6 | Self-care ..... 4 | Hearing ..... 5 |
| | Additional supports ..... 7 | Unknown ..... 8 |

| **9. Ethnicity (please circle)** | | |
|---|---|---|
| White welsh ..... 3 | White Scottish ..... 1 | White English ..... 2 |
| White Irish ..... 6 | White Northern Irish ..... 4 | White British ..... 5 |
| Any other white group ..... 9 | White Gypsy/Traveler ..... 7 | White Polish ..... 8 |
| Indian; Indian Scottish; Indian British ..... 12 | Any mixed/multiple ethics group ..... 10 | Pakistani; Pakistani Scottish; Pakistani British ..... 11 |
| Other Asian ..... 15 | Bangladeshi; Bangladeshi Scottish; Bangladeshi British ..... 13 | Chinese; Chinese Scottish; Chinese British ..... 14 |
| Black; Black Scottish; Black British ..... 18 | African; African Scottish; African British ..... 16 | Caribbean; Caribbean Scottish; Caribbean British ..... 17 |
| | Other Black ..... 19 | Unknown ..... 20 |

Completed by:

Version 2 - 2014




Version 2.0—30/09/2014

| Section | Item | N | Parent | | Teacher | |
|---|---|---|---|---|---|---|
| | | | N | % | N | % |
| **Home activities/Life skills** | 1 | 720 | 396 | 98.8 | 324 | 96.7 |
| | 2 | 721 | 394 | 98.3 | 327 | 97.6 |
| | 3 | 712 | 397 | 99.0 | 315 | 94.0 |
| | 4 | 726 | 396 | 98.8 | 330 | 98.5 |
| | 5 | 689 | 394 | 98.3 | 295 | 88.1 |
| | 6 | 725 | 397 | 99.0 | 328 | 97.9 |
| | | | | 98.7 | | 95.4 |
| **Nursery/ school activities** | 7 | 716 | 388 | 96.8 | 328 | 97.9 |
| | 8 | 701 | 384 | 95.8 | 317 | 94.6 |
| | 9 | 714 | 386 | 96.3 | 328 | 97.9 |
| | 10 | 696 | 380 | 94.8 | 316 | 94.3 |
| | 11 | 705 | 378 | 94.3 | 327 | 97.6 |
| | 12 | 687 | 379 | 94.5 | 308 | 91.9 |
| | | | | 95.4 | | 95.7 |
| **Community activities** | 13 | 629 | 394 | 98.3 | 235 | 70.1 |
| | 14 | 702 | 388 | 96.8 | 314 | 93.7 |
| | 15 | 580 | 368 | 91.8 | 212 | 63.3 |
| | 16 | 678 | 395 | 98.5 | 283 | 84.5 |
| | 17 | 639 | 395 | 98.5 | 244 | 72.8 |
| | 18 | 631 | 388 | 96.8 | 243 | 72.5 |
| | | | | 96.8 | | 76.2 |
| **Routine & Role** | 19 | 704 | 388 | 96.8 | 316 | 94.3 |
| | 20 | 714 | 386 | 96.3 | 328 | 97.9 |
| | 21 | 704 | 377 | 94.0 | 327 | 97.6 |
| | 22 | 718 | 389 | 97.0 | 329 | 98.2 |
| | 23 | 700 | 380 | 94.8 | 320 | 95.5 |
| | | | | 95.8 | | 96.7 |
| **Confidence** | 24 | 713 | 384 | 95.8 | 329 | 98.2 |
| | 25 | 721 | 391 | 97.5 | 330 | 98.5 |
| | 26 | 709 | 385 | 96.0 | 324 | 96.7 |
| | 27 | 708 | 387 | 96.5 | 321 | 95.8 |
| | 28 | 717 | 390 | 97.3 | 327 | 97.6 |
| | | | | 96.6 | | 97.4 |
| **Social Skills** | 29 | 722 | 394 | 98.3 | 328 | 97.9 |
| | 30 | 721 | 394 | 98.3 | 327 | 97.6 |
| | 31 | 723 | 394 | 98.3 | 329 | 98.2 |
| | 32 | 719 | 393 | 98.0 | 326 | 97.3 |
| | 33 | 718 | 391 | 97.5 | 327 | 97.6 |
| | | | | 98.1 | | 97.7 |

| Section | Item | N | Parent | | Teacher | |
|---|---|---|---|---|---|---|
| | | | N | % | N | % |
| **Organisation** | 34 | 713 | 384 | 95.8 | 329 | 98.2 |
| | 35 | 707 | 385 | 96.0 | 322 | 96.1 |
| | 36 | 718 | 389 | 97.0 | 329 | 98.2 |
| | 37 | 720 | 389 | 97.0 | 331 | 98.8 |
| | 38 | 717 | 388 | 96.8 | 329 | 98.2 |
| | | | | 96.5 | | 97.9 |
| **Physical skills** | 39 | 717 | 391 | 97.5 | 326 | 97.3 |
| | 40 | 721 | 392 | 97.8 | 329 | 98.2 |
| | 41 | 719 | 393 | 98.0 | 326 | 97.3 |
| | 42 | 713 | 389 | 97.0 | 324 | 96.7 |
| | 43 | 699 | 385 | 96.0 | 314 | 93.7 |
| | | | | 97.3 | | 96.6 |
| **Environment** | 44 | 725 | 395 | 98.5 | 330 | 98.5 |
| | 45 | 704 | 387 | 96.5 | 317 | 94.6 |
| | 46 | 712 | 392 | 97.8 | 320 | 95.5 |
| | 47 | 708 | 395 | 98.5 | 313 | 93.4 |
| | 48 | 714 | 390 | 97.3 | 324 | 96.7 |
| | 49 | 700 | 384 | 95.8 | 316 | 94.3 |
| | | | | 97.4 | | 95.5 |
| **Emotions and sensations** | 50 | 49 | 27 | 6.7 | 22 | 6.6 |
| | 51 | 48 | 27 | 6.7 | 21 | 6.3 |
| | 52 | 48 | 27 | 6.7 | 21 | 6.3 |
| | 53 | 46 | 26 | 6.5 | 20 | 6.0 |
| | 54 | 48 | 27 | 6.7 | 21 | 6.3 |

```
&INST
Title= "SPSS Data Set Coded diagnoses.sav"
; SPSS file created or last modified: 02/02/2016 08:54:50
;
;    SPSS Cases processed = 736
; SPSS Variables processed = 113
ITEM1 = 1 ; Starting column of item responses
NI = 54 ; Number of items
NAME1 = 110 ; Starting column for person label in data record
NAMLEN = 92 ; Length of person label
XWIDE = 2 ; Matches the widest data value observed
; GROUPS = 0 ; Partial Credit model: in case items have different rating
scales
CODES = "1 2 3 4 " ; matches the data
TOTALSCORE = Yes ; Include extreme responses in reported scores
; Person Label variables: columns in label: columns in line
@CHILD = 1E13 ; $C110W13
@RESPONDE = 15E15 ; $C124W1
@AGEYRS = 17E18 ; $C126W2
@GENDER = 20E20 ; $C129W1
@SCHOOL = 22E22 ; $C131W1
@DCD = 24E25 ; $C133W2
@DEVELOPM = 27E28 ; $C136W2
@CPORABI = 30E31 ; $C139W2
@SEIZURES = 33E34 ; $C142W2
@ASD = 36E37 ; $C145W2
@PREMATUR = 39E40 ; $C148W2
@ADD = 42E43 ; $C151W2
@LEARNING = 45E46 ; $C154W2
@VISUALAU = 48E49 ; $C157W2
@BEHAVIOU = 51E52 ; $C160W2
@FINEMOTO = 54E55 ; $C163W2
@GROSSMOT = 57E58 ; $C166W2
@SENSORYP = 60E61 ; $C169W2
@FEEDINGD = 63E64 ; $C172W2
@DRESSING = 66E67 ; $C175W2
@ORGANISA = 69E70 ; $C178W2
@HANDWRIT = 72E73 ; $C181W2
@SOCIALIN = 75E76 ; $C184W2
@ACADEMIC = 78E79 ; $C187W2
@EQUIPMEN = 81E82 ; $C190W2
@HYPERMOB = 84E85 ; $C193W2
@MULTIPLE = 87E88 ; $C196W2
@FUNCTION = 90E91 ; $C199W2
&END ; Item labels follow: columns in label
LIFEA ; Item 1 : 1-2
LIFEB ; Item 2 : 3-4
LIFEC ; Item 3 : 5-6
LIFED ; Item 4 : 7-8
LIFEE ; Item 5 : 9-10
LIFEF ; Item 6 : 11-12
SCHOOLA ; Item 7 : 13-14
```

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SCHOOLB ; Item 8 : 15-16
SCHOOLC ; Item 9 : 17-18
SCHOOLD ; Item 10 : 19-20
SCHOOLE ; Item 11 : 21-22
SCHOOLF ; Item 12 : 23-24
COMMA ; Item 13 : 25-26
COMMB ; Item 14 : 27-28
COMMC ; Item 15 : 29-30
COMMD ; Item 16 : 31-32
COMME ; Item 17 : 33-34
COMMF ; Item 18 : 35-36
ROUA ; Item 19 : 37-38
ROUB ; Item 20 : 39-40
ROUC ; Item 21 : 41-42
ROUD ; Item 22 : 43-44
ROUE ; Item 23 : 45-46
CONA ; Item 24 : 47-48
CONB ; Item 25 : 49-50
CONC ; Item 26 : 51-52
COND ; Item 27 : 53-54
CONE ; Item 28 : 55-56
SOCA ; Item 29 : 57-58
SOCB ; Item 30 : 59-60
SOCC ; Item 31 : 61-62
SOCD ; Item 32 : 63-64
SOCE ; Item 33 : 65-66
ORGA ; Item 34 : 67-68
ORGB ; Item 35 : 69-70
ORGC ; Item 36 : 71-72
ORGD ; Item 37 : 73-74
ORGE ; Item 38 : 75-76
PHYA ; Item 39 : 77-78
PHYB ; Item 40 : 79-80
PHYC ; Item 41 : 81-82
PHYD ; Item 42 : 83-84
PHYE ; Item 43 : 85-86
ENVA ; Item 44 : 87-88
ENVB ; Item 45 : 89-90
ENVC ; Item 46 : 91-92
ENVD ; Item 47 : 93-94
ENVE ; Item 48 : 95-96
ENVF ; Item 49 : 97-98
EMOA ; Item 50 : 99-100
EMOB ; Item 51 : 101-102
EMOC ; Item 52 : 103-104
EMOD ; Item 53 : 105-106
EMOE ; Item 54 : 107-108
END NAMES
```

| Item number | Measure | Model S.E. | INFIT MnSq | INFIT ZSTD | OUTFIT MnSq | OUTFIT ZSTD | Ptmea. Corr. |
|---|---|---|---|---|---|---|---|
| **LA1** | -0.92 | 0.05 | 1.19 | 3.50 | 1.14 | 2.01 | 0.56 |
| **LA2** | -0.20 | 0.05 | 0.92 | -1.81 | 0.88 | -2.29 | 0.63 |
| **LA3** | -0.46 | 0.05 | 0.98 | -0.41 | 0.97 | -0.50 | 0.60 |
| **LA4** | 0.11 | 0.05 | 0.89 | -2.35 | 0.88 | -2.33 | 0.67 |
| **LA5** | 0.09 | 0.05 | 1.02 | 0.38 | 1.02 | 0.42 | 0.64 |
| **LA6** | 0.56 | 0.05 | 0.88 | -2.58 | 0.87 | -2.59 | 0.66 |
| **SA1** | -0.24 | 0.05 | 0.85 | -3.40 | 0.90 | -1.90 | 0.58 |
| **SA2** | 0.66 | 0.05 | 1.12 | 2.35 | 1.13 | 2.44 | 0.53 |
| **SA3** | -0.25 | 0.05 | 0.86 | -3.00 | 0.92 | -1.58 | 0.59 |
| **SA4** | 0.06 | 0.05 | 0.78 | -4.98 | 0.77 | -4.78 | 0.67 |
| **SA5** | -0.22 | 0.05 | 1.02 | 0.39 | 1.01 | 0.12 | 0.65 |
| **SA6** | -0.69 | 0.05 | 0.99 | -0.27 | 0.91 | -1.50 | 0.65 |
| **CA1** | -0.33 | 0.05 | 1.48 | 8.22 | 1.44 | 6.60 | 0.54 |
| **CA2** | -0.22 | 0.05 | 0.83 | -3.83 | 0.81 | -3.61 | 0.69 |
| **CA3** | -0.33 | 0.06 | 1.17 | 3.05 | 1.14 | 2.15 | 0.64 |
| **CA4** | -0.83 | 0.06 | 0.87 | -2.70 | 0.81 | -3.17 | 0.66 |
| **CA5** | -0.57 | 0.06 | 0.89 | -2.30 | 0.85 | -2.49 | 0.65 |
| **CA6** | -0.19 | 0.05 | 0.99 | -0.15 | 0.95 | -0.79 | 0.67 |
| **RO1** | 0.74 | 0.05 | 1.09 | 1.75 | 1.09 | 1.69 | 0.65 |
| **RO2** | 0.27 | 0.05 | 0.90 | -2.09 | 0.92 | -1.62 | 0.65 |
| **RO3** | -0.38 | 0.05 | 0.76 | -5.52 | 0.73 | -5.27 | 0.70 |
| **RO4** | 0.31 | 0.05 | 0.82 | -4.02 | 0.80 | -4.25 | 0.75 |
| **RO5** | 0.43 | 0.05 | 0.73 | -6.07 | 0.73 | -5.87 | 0.76 |
| **CO1** | 0.65 | 0.05 | 0.86 | -2.87 | 0.93 | -1.43 | 0.50 |
| **CO2** | -0.07 | 0.05 | 0.88 | -2.72 | 0.94 | -1.22 | 0.54 |
| **CO3** | 0.30 | 0.05 | 0.99 | -0.25 | 1.04 | 0.75 | 0.48 |
| **CO4** | 0.37 | 0.05 | 1.23 | 4.34 | 1.23 | 4.13 | 0.57 |
| **CO5** | 0.46 | 0.05 | 1.08 | 1.70 | 1.12 | 2.32 | 0.56 |
| **SS1** | 0.01 | 0.05 | 0.78 | -4.88 | 0.79 | -4.44 | 0.63 |
| **SS2** | -0.50 | 0.05 | 1.09 | 1.82 | 1.10 | 1.76 | 0.56 |
| **SS3** | -0.19 | 0.05 | 1.14 | 2.79 | 1.13 | 2.34 | 0.56 |
| **SS4** | 0.13 | 0.05 | 1.10 | 1.99 | 1.09 | 1.80 | 0.62 |
| **SS5** | 0.30 | 0.05 | 1.26 | 4.98 | 1.23 | 4.25 | 0.53 |
| **OR1** | 0.68 | 0.05 | 0.71 | -6.46 | 0.71 | -6.28 | 0.70 |
| **OR2** | 1.36 | 0.05 | 0.74 | -5.45 | 0.77 | -4.70 | 0.58 |
| **OR3** | 1.50 | 0.06 | 0.83 | -3.43 | 0.84 | -3.23 | 0.64 |
| **OR4** | 0.91 | 0.05 | 0.64 | -8.36 | 0.64 | -8.07 | 0.65 |
| **OR5** | 0.78 | 0.05 | 0.69 | -6.94 | 0.70 | -6.50 | 0.65 |
| **PS1** | 0.71 | 0.05 | 0.93 | -1.51 | 0.95 | -0.96 | 0.58 |
| **PS2** | 0.22 | 0.05 | 1.05 | 1.01 | 1.08 | 1.54 | 0.53 |

| Item number | Measure | Model S.E. | INFIT MnSq | INFIT ZSTD | OUTFIT MnSq | OUTFIT ZSTD | Ptmea. Corr. |
|---|---|---|---|---|---|---|---|
| **PS3** | 0.05 | 0.05 | 1.15 | 2.96 | 1.18 | 3.21 | 0.50 |
| **PS4** | 0.70 | 0.05 | 0.96 | -0.72 | 0.96 | -0.77 | 0.60 |
| **PS5** | -0.13 | 0.05 | 1.30 | 5.76 | 1.37 | 6.23 | 0.50 |
| **EN1** | -0.41 | 0.05 | 0.99 | -0.25 | 1.04 | 0.75 | 0.53 |
| **EN2** | -1.03 | 0.06 | 1.29 | 5.09 | 1.31 | 4.16 | 0.42 |
| **EN3** | -1.88 | 0.07 | 1.37 | 5.17 | 1.75 | 6.31 | 0.27 |
| **EN4** | -1.26 | 0.06 | 1.68 | 9.90 | 1.89 | 9.52 | 0.28 |
| **EN5** | -1.64 | 0.06 | 1.34 | 5.16 | 1.39 | 4.01 | 0.29 |
| **EN6** | 0.56 | 0.05 | 1.13 | 2.55 | 1.13 | 2.49 | 0.64 |
| **EM1** | -1.21 | 0.21 | 0.74 | -1.37 | 0.71 | -1.29 | 0.68 |
| **EM2** | 0.18 | 0.19 | 0.95 | -0.22 | 1.02 | 0.15 | 0.40 |
| **EM3** | 0.63 | 0.20 | 0.60 | -2.43 | 0.63 | -2.21 | 0.60 |
| **EM4** | 1.14 | 0.21 | 1.29 | 1.38 | 1.27 | 1.28 | 0.58 |
| **EM5** | 0.14 | 0.19 | 0.92 | -0.41 | 0.90 | -0.47 | 0.58 |

| Item | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total DIF (R>30) |
|---|---|---|---|---|---|---|---|---|
| **LA1P** | < 0.71 * | 0.05 | 0.12 | 0.07 | -0.41 | 0.11 | 0.00 | 0 |
| **LA1E** | < 1.62 * | < 0.63 * | -0.15 | -0.21 | 0.12 | -0.93 | -0.79 | 0 |
| **LA2P** | < 0.57 | -0.11 | 0.14 | 0.13 | -0.14 | 0.09 | -0.08 | 0 |
| **LA2E** | < 1.05 * | 0.56 * | 0.44 * | -0.21 | -0.11 | -0.28 | **-1.03 *** | 1 |
| **LA3P** | < -0.29 | 0.22 | 0.06 | 0.12 | -0.09 | 0.22 | 0.03 | 0 |
| **LA3E** | < 0.68 * | < 0.82 * | 0.40 * | -0.47 | -0.04 | -0.62 * | -0.49 | 0 |
| **LA4** | 0.14 | -0.18 | 0.22 * | -0.10 | 0.09 | 0.00 | 0.04 | 0 |
| **LA5** | **1.14 *** | 0.00 | -0.03 | -0.17 | 0.00 | 0.00 | 0.00 | 1 |
| **LA6P** | < -0.69 * | 0.43 | 0.24 | -0.17 | -0.12 | 0.00 | 0.17 | 0 |
| **LA6E** | < -0.62 | -0.28 | 0.28 | 0.53 * | 0.21 | -0.14 | -0.23 | 0 |
| **SA1** | 0.40 | 0.21 | 0.14 | 0.00 | -0.23 | 0.19 | -0.24 | 0 |
| **SA2** | **0.73 *** | **0.64 *** | 0.00 | -0.10 | 0.14 | 0.15 | -0.30 | 2 |
| **SA3** | -0.10 | 0.10 | 0.00 | -0.13 | -0.06 | -0.03 | -0.27 | 0 |
| **SA4** | 0.00 | 0.23 | -0.17 | -0.09 | -0.07 | -0.08 | 0.09 | 0 |
| **SA5P** | < 0.88 * | **0.68 *** | 0.09 | 0.30 | -0.64 * | -0.16 | -0.25 | 1 |
| **SA5E** | < -0.03 | -0.32 | 0.00 | 0.14 | 0.25 | 0.04 | -0.21 | 0 |
| **SA6** | **2.04 *** | **0.69** * | 0.39 * | -0.15 | -0.04 | -0.40 * | **-0.78 *** | 3 |
| **CA1** | < -0.08 | 0.35 | -0.05 | -0.11 | -0.19 | -0.02 | -0.14 | 0 |
| **CA2** | **0.66 *** | 0.04 | 0.00 | -0.05 | -0.09 | -0.13 | -0.16 | 1 |
| **CA3** | < 0.96 * | 0.00 | -0.12 | -0.10 | -0.05 | 0.00 | -0.27 | 0 |
| **CA4** | 0.11 | 0.00 | -0.08 | -0.04 | 0.11 | -0.10 | 0.06 | 0 |
| **CA5P** | < 0.24 | -0.51 | -0.05 | -0.36 | 0.35 | -0.09 | 0.18 | 0 |
| **CA5E** | < -0.32 | < 0.17 | -0.28 | < 0.37 | < 0.09 | 0.08 | -0.25 | 0 |
| **CA6** | **1.82 *** | 0.43 * | 0.42 * | 0.24 | -0.08 | -0.45 | -0.45 | 1 |
| **RO1** | 0.14 | -0.02 | -0.10 | 0.07 | 0.05 | 0.17 | -0.16 | 0 |
| **RO2** | -0.56 * | -0.4 * | 0.06 | 0.10 | -0.10 | 0.19 | -0.10 | 0 |
| **RO3** | -0.12 | -0.09 | -0.17 | 0.03 | -0.12 | 0.07 | -0.03 | 0 |
| **RO4P** | < 0.25 | 0.26 | -0.28 | 0.00 | 0.05 | 0.43 | -0.21 | 0 |
| **RO4E** | < 0.95 * | < -0.09 | -0.03 | 0.14 | 0.03 | 0.08 | -0.21 | 0 |
| **RO5** | 0.29 | 0.02 | -0.12 | -0.13 | 0.21 | 0.06 | -0.14 | 0 |
| **CO1** | **-1.03 *** | -0.34 | -0.35 * | -0.08 | 0.27 | 0.12 | 0.38 * | 1 |
| **CO2** | **-1.33 *** | **-0.85 *** | -0.16 | 0.00 | 0.35 * | 0.19 | 0.28 | 2 |
| **CO3** | **-1.33 *** | **-0.91 *** | -0.30 * | -0.04 | 0.30 | 0.49 * | 0.53 * | 2 |
| **CO4P** | < 0.32 | 0.34 | -0.08 | 0.05 | 0.10 | -0.05 | -0.49 | 0 |
| **CO4E** | < 2.54 * | < 1.16 * | 0.24 | -0.37 | -0.11 | -0.45 * | -0.42 | 0 |
| **CO5** | -0.63 * | -0.12 | -0.12 | 0.43 * | 0.09 | 0.09 | -0.20 | 0 |
| **SS1** | -0.31 | -0.15 | -0.21 | 0.00 | 0.03 | 0.08 | 0.16 | 0 |
| **SS2** | 0.72 * | -0.03 | -0.36 | -0.15 | 0.02 | -0.09 | 0.19 | 0 |
| **SS3** | 0.42 | 0.00 | -0.12 | -0.13 | -0.06 | 0.04 | 0.12 | 0 |
| **SS4P** | < -0.29 | -0.41 | 0.00 | 0.00 | -0.41 | 0.06 | 0.10 | 0 |
| **SS4E** | < 0.23 | < 0.00 | -0.18 | -0.21 | 0.07 | 0.03 | 0.36 | 0 |

| Item | 4 | 5 | 6 | 7 | 8 | 9 | 10 | Total DIF (R>30) |
|---|---|---|---|---|---|---|---|---|
| **SS5P** | < -0.53 | -0.48 | -0.18 | -0.14 | -0.14 | 0.31 | 0.19 | 0 |
| **SS5E** | < -0.94 * | < -0.45 | 0.11 | -0.57 * | 0.02 | 0.27 | 0.43 | 0 |
| **OR1** | -0.18 | -0.23 | 0.00 | -0.14 | 0.04 | 0.26 | 0.11 | 0 |
| **OR2** | **-1.10** * | -0.19 | 0.12 | 0.18 | 0.26 | -0.07 | 0.12 | 1 |
| **OR3** | -0.45 | -0.16 | 0.05 | 0.40 * | 0.34 | -0.25 | 0.00 | 0 |
| **OR4** | -0.62 * | -0.46 * | 0.02 | 0.02 | 0.30 | 0.13 | 0.14 | 0 |
| **OR5** | -0.31 | -0.12 | 0.03 | -0.05 | 0.22 | -0.06 | 0.04 | 0 |
| **PS1** | -0.43 | 0.09 | 0.26 * | 0.05 | -0.25 | -0.29 | 0.31 | 0 |
| **PS2** | -0.23 | 0.14 | 0.35 * | 0.00 | -0.32 | -0.30 * | 0.31 | 0 |
| **PS3** | -0.41 | 0.07 | 0.02 | 0.24 | -0.13 | 0.06 | 0.02 | 0 |
| **PS4** | 0.58 * | 0.54 * | -0.02 | 0.05 | -0.32 | -0.15 | 0.09 | 0 |
| **PS5** | **-1.44 *** | -0.05 | -0.03 | 0.20 | -0.23 | -0.03 | **0.72** * | 2 |
| **Total DIF (R > 30)** | 10 | 5 | 0 | 0 | 0 | 0 | 3 | |

Appendix 13 – DIF According to Reasons for Referral

| Item | 1 | 2 | 5 | 7 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **LA1P** | -0.1 | < 0.61 * | 0.13 | < 0.04 | < 0.13 | < -0.32 | -0.05 | -0.14 | 0.27 | 0.12 | 0.13 | -0.21 | -0.07 | -0.33 | 0 |
| **LA1E** | -0.27 | < 1.45 * | -0.08 | < -0.04 | < 0.41 | < 0.08 | 0.03 | 0 | 0.35 | 0.13 | 0.3 | -0.08 | 0.06 | < 0.19 | 0 |
| **LA2P** | 0.12 | < -0.45 | 0 | < -0.04 | < 0.05 | < -0.38 | 0.03 | 0 | -0.34 * | 0.04 | 0 | -0.25 | 0 | -0.44 | 0 |
| **LA2E** | 0.05 | < 0.89 * | 0.05 | < -0.07 | < 0.08 | < -0.08 | 0.04 | 0.12 | -0.16 | -0.05 | 0.18 | 0.11 | -0.1 | -0.11 | 0 |
| **LA3P** | 0.08 | < -0.4 | -0.12 | < -0.62 * | < -0.02 | < -0.49 | 0.22 * | 0.15 | -0.34 * | 0.49 * | 0.04 | 0 | 0.05 | 0 | 0 |
| **LA3E** | 0 | < 0.45 | -0.12 | < -0.51 | < 0.75 * | < -0.52 | 0.11 | 0.25 * | 0 | 0.21 | 0.06 | -0.07 | 0 | -0.23 | 0 |
| **LA4** | 0.18 | -0.26 | 0.12 | 0.37 | 0 | -0.18 | -0.02 | 0 | -0.03 | -0.05 | -0.03 | 0.07 | -0.07 | 0.06 | 0 |
| **LA5** | 0.11 | 0.03 | -0.04 | 0.29 | -0.15 | -0.24 | -0.04 | 0 | -0.08 | -0.13 | 0.07 | 0.11 | 0 | -0.29 | 0 |
| **LA6P** | 0.03 | < -0.35 | 0.15 | < 0.45 | < -0.25 | < 0.05 | -0.05 | -0.13 | 0.23 | 0.08 | -0.17 | 0.1 | 0.12 | 0 | 0 |
| **LA6E** | -0.23 | < -0.29 | -0.42 * | < 0.34 | < 0.03 | < 0.35 | -0.11 | -0.15 | 0.14 | 0 | -0.13 | 0.18 | 0.13 | 0 | 0 |
| **SA1** | -0.04 | -0.16 | -0.48 * | -0.28 | 0.1 | **-0.67 *** | 0.2 * | 0 | -0.25 * | -0.41 * | -0.09 | -0.22 * | 0.23 * | -0.21 | 1 |
| **SA2** | -0.16 | -0.09 | **-0.79 *** | -0.09 | -0.1 | -0.56 * | 0.19 * | -0.08 | -0.3 * | -0.05 | 0 | -0.02 | 0.36 * | -0.19 | 1 |
| **SA3** | 0.19 | -0.22 | 0.06 | 0.04 | -0.12 | -0.03 | 0 | 0.05 | 0 | -0.15 | -0.11 | -0.12 | -0.03 | -0.06 | 0 |
| **SA4** | -0.13 | -0.14 | -0.15 | 0.42 * | -0.24 | 0.06 | 0 | -0.06 | 0.1 | -0.37 | -0.15 | 0.07 | 0.12 | -0.26 | 0 |
| **SA5P** | -0.15 | < 0.76 * | 0.15 | < 0.03 | < 0.06 | < -0.32 | 0.04 | -0.06 | 0.13 | 0.42 | 0.39 * | -0.42 * | -0.04 | -0.19 | 0 |
| **SA5E** | 0 | < -0.22 | 0 | < 0.38 | < -0.09 | < 0.03 | -0.09 | -0.07 | 0.03 | -0.35 | -0.06 | 0.27 | 0.05 | 0.16 | 0 |
| **SA6** | -0.13 | **0.66 *** | -0.06 | -0.12 | 0.23 | -0.48 * | 0.06 | 0.07 | 0.06 | -0.09 | 0.26 * | -0.18 | 0.05 | 0.08 | 1 |
| **CA1** | 0.15 | < 0.13 | 0.25 | **-0.72 *** | -0.15 | -0.08 | 0.02 | 0.25 * | -0.23 | 0 | 0.34 * | -0.17 | 0.03 | 0.23 | 1 |
| **CA2** | -0.2 | 0.53 * | 0.51 * | -0.03 | 0.06 | 0.08 | 0 | 0.04 | 0.29 * | 0.25 | 0.03 | -0.32 * | -0.19 * | 0.31 | 0 |
| **CA3** | -0.03 | 0.09 | 0.49 * | 0 | -0.59 * | 0.14 | -0.06 | -0.06 | 0.2 | -0.07 | 0.14 | -0.26 * | -0.1 | 0.71 | 0 |
| **CA4** | -0.22 | -0.14 | **0.68 *** | 0.37 | **-0.69 *** | **0.83 *** | -0.15 * | -0.09 | 0.36 * | 0.12 | 0 | 0 | -0.2 * | 0.29 | 3 |
| **CA5P** | -0.21 | < 0.22 | 0.4 * | < 0.36 | < 0.35 | < 0.29 | -0.07 | 0 | 0.09 | 0.06 | 0 | -0.02 | -0.1 | 0 | 0 |
| **CA5E** | -0.09 | < -0.02 | 0.21 | < -0.47 | < -0.46 | < 0.75 * | -0.08 | -0.02 | -0.12 | 0.6 | 0.05 | -0.12 | -0.07 | < 0.53 | 0 |
| **CA6** | -0.05 | 0.62 * | -0.07 | -0.12 | 0.17 | -0.34 | 0.03 | 0.03 | -0.11 | 0.15 | 0.26 * | -0.08 | 0 | -0.21 | 0 |
| **RO1** | 0.18 | -0.02 | -0.03 | 0.22 | -0.06 | -0.32 | 0 | -0.03 | -0.05 | -0.18 | 0.13 | 0.12 | 0.03 | 0 | 0 |

| Item | 1 | 2 | 5 | 7 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **RO2** | 0.06 | -0.2 | 0.4 * | 0.5 * | -0.33 | 0.39 | -0.09 | 0 | 0.44 * | 0.14 | -0.09 | 0.1 | -0.09 | 0.23 | 0 |
| **RO3** | -0.13 | 0 | 0.25 | 0.3 | -0.16 | 0.19 | 0 | 0 | 0.23 | 0 | 0.04 | 0.02 | 0 | 0.1 | 0 |
| **RO4P** | 0 | < -0.45 | 0.54 * | < 0.34 | < -0.18 | < 0.24 | 0 | -0.17 | 0.15 | -0.06 | 0.17 | 0.02 | 0.06 | 0.57 | 0 |
| **RO4E** | -0.17 | < -0.35 | 0.16 | < 0.2 | < -0.25 | < 0.21 | -0.06 | -0.11 | 0.13 | -0.16 | 0.09 | -0.08 | -0.08 | 0.12 | 0 |
| **RO5** | 0 | -0.04 | 0.45 * | 0.21 | -0.08 | 0.18 | -0.07 | -0.14 | 0.16 | -0.32 | 0 | 0.11 | -0.07 | 0.31 | 0 |
| **CO1** | 0.11 | -0.4 | -0.28 * | -0.3 | -0.02 | 0.16 | -0.02 | -0.04 | -0.06 | -0.06 | -0.12 | 0.17 | 0.11 | -0.41 | 0 |
| **CO2** | 0.1 | -0.41 | -0.08 | 0.06 | -0.05 | 0.16 | -0.07 | -0.1 | 0.05 | -0.16 | -0.21 | 0.16 | 0.04 | -0.06 | 0 |
| **CO3** | 0.13 | **-0.77 *** | -0.23 | -0.06 | -0.31 | -0.15 | -0.07 | -0.12 | -0.28 * | -0.09 | -0.26 * | 0.1 | 0.06 | -0.49 | 1 |
| **CO4P** | -0.24 | < 0.31 | 0.11 | < 0.07 | < 0.35 | < 0.59 | 0 | 0 | 0.18 | -0.03 | -0.38 * | 0.11 | -0.08 | 0.39 | 0 |
| **CO4E** | -0.18 | < 0.12 | 0.35 | < 0.04 | < 0.23 | < 0.13 | 0 | -0.07 | 0.34 | 0 | -0.04 | -0.25 | -0.16 | 0.22 | 0 |
| **CO5** | -0.21 | **-0.68 *** | 0.03 | 0.16 | -0.34 | 0.37 | 0 | -0.09 | 0.23 | -0.21 | -0.16 | 0.03 | 0 | 0 | 1 |
| **SS1** | -0.04 | -0.3 | 0.52 * | 0.1 | -0.23 | 0.44 * | -0.07 | -0.05 | 0.23 | 0 | -0.09 | -0.05 | -0.06 | 0.39 | 0 |
| **SS2** | -0.05 | 0.18 | 0.54 * | 0.13 | -0.45 * | 0.24 | -0.05 | -0.05 | 0.19 | -0.07 | -0.03 | -0.12 | -0.11 | 0.49 | 0 |
| **SS3** | -0.09 | 0.71 * | -0.06 | -0.28 | 0.47 * | 0.11 | -0.04 | -0.02 | 0.2 | -0.12 | -0.11 | 0 | -0.04 | 0.34 | 0 |
| **SS4P** | -0.27 | < -0.08 | **0.85 *** | < 0.29 | < -0.04 | < 1.04 * | -0.06 | -0.05 | 0.42 * | -0.25 | -0.05 | -0.16 | -0.14 | 0.84 | 1 |
| **SS4E** | 0 | < -0.75 * | 0.63 * | < 0.24 | < -0.51 | < 1.19 * | -0.1 | -0.08 | 0.46 * | 0.31 | -0.07 | -0.16 | -0.14 | 0.49 | 0 |
| **SS5P** | -0.22 | < 0.32 | 0.35 | < 0.07 | < 0.52 | < 0.72 * | -0.08 | -0.04 | 0.21 | -0.12 | -0.28 | 0.24 | -0.06 | 0.39 | 0 |
| **SS5E** | -0.04 | < -0.27 | -0.04 | < 0.2 | < -0.35 | < -0.27 | 0 | -0.09 | 0.24 | 0.31 | -0.19 | 0.05 | -0.06 | 0.03 | 0 |
| **OR1** | 0.12 | -0.39 | -0.16 | -0.02 | -0.03 | -0.51 * | 0 | -0.11 | 0 | -0.05 | -0.12 | 0.12 | 0 | -0.17 | 0 |
| **OR2** | 0.04 | -0.1 | -0.49 * | 0.39 | 0.04 | 0.21 | -0.05 | -0.07 | -0.2 | -0.06 | -0.21 | 0.19 | 0.07 | -0.09 | 0 |
| **OR3** | -0.12 | 0.12 | -0.08 | -0.05 | 0.22 | 0.39 | 0 | 0 | 0.05 | 0.13 | 0 | 0.21 | -0.08 | -0.05 | 0 |
| **OR4** | -0.06 | 0 | -0.25 | 0.13 | 0.03 | 0.15 | 0 | -0.11 | 0.03 | -0.05 | -0.09 | 0.26 | -0.05 | -0.1 | 0 |
| **OR5** | 0.03 | 0.29 | -0.34 * | 0.13 | 0.19 | -0.03 | -0.06 | -0.13 | 0 | 0.04 | 0 | 0.27 | -0.08 | -0.4 | 0 |
| **PS1** | 0.41 * | 0.07 | -0.63 | -0.17 | **0.67 *** | -0.09 | -0.1 | 0.19 * | -0.45 * | 0.2 | -0.06 | -0.02 | -0.09 | -0.3 | 1 |
| **PS2** | 0.29 * | 0.44 | **-0.66 *** | -0.47 * | 0.77 * | -0.2 | 0 | 0.29 * | -0.35 * | 0.12 | 0.18 | 0 | 0 | -0.48 | 1 |
| **PS3** | 0.11 | -0.24 | **-0.66 *** | **-0.67 *** | -0.07 | -0.55 * | 0.22 * | 0.17 * | **-0.65 *** | 0.2 | 0.06 | -0.09 | 0.25 * | -0.25 | 3 |
| **PS4** | 0.07 | 0.44 | -0.26 | -0.62 * | 0.06 | -0.57 * | 0.19 * | 0.33 * | -0.59 * | 0.39 | 0.37 * | -0.22 | 0.06 | -0.26 | 0 |

| Item | 1 | 2 | 5 | 7 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **PS5** | 0.20 | -0.063 | -0.155 | -0.522* | 0.392 | -0.462* | 0.090 | 0.260* | -0.341* | 0.250 | 0.290* | 0 | 0.1 | -0.390 | 0 |

**ACHIEVE Assessment – Parent Questionnaire**
**Version 1.3(S) – 2014**

An assessment has been requested for your child. To gain a complete picture of your child's abilities and difficulties we would like you to fill in a questionnaire.

Your child's therapist uses this form to collect information to complete an assessment of your child's strengths and challenges. Your input is an important part of completing this assessment, and helps develop a good picture of your child's abilities and needs. Since you are the expert on your child, your responses will also help identify what areas are most important to work on first in therapy.

The therapist that you will see will find it very useful to read this information before they see your child and will be used if your child requires follow up from these services.

**Parent Questionnaire:**

- This questionnaire is designed for children from nursery to secondary school; please answer as many questions as you can so we have a full understanding of your child.

**Education Questionnaire:**

- We have asked your child's nursery/school to complete a questionnaire so we have a full understanding of your child. You will be able to see this information at your child's appointment if you wish.

Your child is likely to have a mixture of ratings. Most young people will have some areas of strength, some areas that are adequate, some areas of minor difficulty, and some areas of strong concern. Completing this assessment as fully as you can gives the therapist a better understanding of your child and areas to be addressed during therapy.

The information in this questionnaire will be treated in the strictest confidence and will only be used to help us put together an accurate profile of your child's abilities. If you have any further questions about this questionnaire or any other aspect of your child's assessment please get in touch with the therapist who sent this to you.

**GOALS – *help us understand your child by*** *telling us what they would like to get better at.*

What do you think YOUR CHILD would like to get better at? .....

.....

.....

.....

What would YOU like your child to get better at? .....

.....

.....

.....

Are there any reasons why reaching these goals might be difficult for your child? .....

.....

.....

.....

**Please circle <u>only one</u> of the four choices, answer each question as fully as possible and select a response for <u>each question</u>**

**DOING ACTIVITIES** - *help us understand **how often** your child gets involved in the activities listed below:*

**HOME ACTIVITIES**

| | <u>None of</u> the time | <u>Some of</u> the time | <u>Most of</u> the time | <u>All of</u> the time |
|---|---|---|---|---|
| a. Your child is able to clean him/herself after they've been to the toilet or manage their own personal hygiene (e.g. washing hands) | 1 | 2 | 3 | 4 |
| b. Your child is able to manage their clothing (e.g. managing their outdoor clothing when going out, taking off a cardigan when they feel warm, manage their shoelaces) | 1 | 2 | 3 | 4 |
| c. Your child is able to help with making/manage their own snacks (e.g. use a fork and or knife, open snack/drink containers) | 1 | 2 | 3 | 4 |
| d. Your child is able to help with or clean up effectively after an activity (e.g. tidy away an activity, tidy their room) | 1 | 2 | 3 | 4 |
| e. Your child is able to get prepared for nursery/school in the morning (e.g. nursery/school bag organised, put on outdoor clothes/shoes) | 1 | 2 | 3 | 4 |
| f. Your child is able to move from one activity to another effectively (e.g. settle to drawing or homework task that requires quiet listening and attention after playing with friends) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**NURSERY/SCHOOL ACTIVITIES**

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your child is able to use learning materials effectively (e.g. pens, pencils, crayons, rulers, glue sticks, scissors, computers) | 1 | 2 | 3 | 4 |
| b. Your child's making shapes/letter forming/handwriting is effective to complete art, maths, story writing (e.g. homework) | 1 | 2 | 3 | 4 |
| c. Your child is able to successfully engage in sports days or other leisure activities in nursery/school | 1 | 2 | 3 | 4 |
| d. Your child is able to successfully engage in curriculum activities (e.g. completing homework tasks) | 1 | 2 | 3 | 4 |
| e. Your child is able to clean him/herself after they've been to the toilet at nursery/school | 1 | 2 | 3 | 4 |
| f. Your child is able to get dressed after P.E. /gym (e.g. change clothes for outdoor play, coat on/off) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**COMMUNITY ACTIVTIES**

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your child is able to ride a scooter/bike, rollerblade, skateboard, scooter etc | 1 | 2 | 3 | 4 |
| b. Your child is able to play with friends in an organised activity (e.g. tag, football, computer games) | 1 | 2 | 3 | 4 |
| c. Your child is able to participate in organised out of nursery/school clubs (e.g. scouts, martial arts, swimming lessons/club) | 1 | 2 | 3 | 4 |
| d. Your child is able to participate in organised social events (e.g. birthday parties, family events) | 1 | 2 | 3 | 4 |
| e. Your child is able to participate with family in leisure activities (e.g. swimming, scooter/bike riding, playing football together) | 1 | 2 | 3 | 4 |
| f. Your child is able to manage his/her clothes before and after an activity (e.g. swimming lesson/after school club) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**ROUTINE & ROLE** – *help us understand how your child **manages his/her routine and responsibilities***

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your child organises routines (e.g. morning routine, getting dressed, brushing teeth, breakfast) | 1 | 2 | 3 | 4 |
| b. Your child copes with changes in his/her routine | 1 | 2 | 3 | 4 |
| c. Your child copes with a variety of activities within their daily routine (e.g. after school club, swimming lessons) | 1 | 2 | 3 | 4 |
| d. Your child understands their responsibilities (e.g. tidying away an activity, laying the table, walking the dog, making bed, completing homework) | 1 | 2 | 3 | 4 |
| e. Your child manages multiple responsibilities within a day (e.g. at home, nursery/school and in the community) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**CONFIDENCE** – *help us understand how **confident** your child is*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your child is confident in their abilities | 1 | 2 | 3 | 4 |
| b Your child enjoys daily activities (e.g. scooter/bike riding, swimming, homework, school work) | 1 | 2 | 3 | 4 |
| b. Your child seems satisfied with his/her performance in activities (e.g. during play or activities in nursery/school) | 1 | 2 | 3 | 4 |
| d. Your child can tell you what he/she wants to get better at (e.g. riding a scooter/bike, nursery/school activity) | 1 | 2 | 3 | 4 |
| e. Your child keeps trying despite challenges doing activities (e.g. playing football, doing homework) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**SOCIAL SKILLS** – *help us understand how your child **interacts socially** with friends, family and other adults*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your child plays well with others | 1 | 2 | 3 | 4 |
| b. Your child is chatty/sociable and talks with their friends | 1 | 2 | 3 | 4 |
| c. Your child speaks clearly when with others (e.g. with family members or with friends) | 1 | 2 | 3 | 4 |
| d. Your child demonstrates an understanding of others' feelings (e.g. with family members or with friends) | 1 | 2 | 3 | 4 |
| e. Your child can ask for the support he/she needs | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**ORGANISATIONAL SKILLS** – *help us understand how your child **organises him/herself** when playing and carrying out activities*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your child organises and uses objects to complete activities (e.g. homework, or household chores) | 1 | 2 | 3 | 4 |
| b. Your child maintains concentration throughout activities | 1 | 2 | 3 | 4 |
| c. Your child works out problems if he/she gets stuck on a task | 1 | 2 | 3 | 4 |
| d. Your child follows through instructions to complete activities | 1 | 2 | 3 | 4 |
| e. Your child completes the steps of an activity in the right order | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**PHYSICAL SKILLS** – *help us understand how your child **physically moves his/her body** when playing and carrying out activities*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your child completes activities without being clumsy (e.g. avoids spilling fluids or banging/breaking objects during household chores) | 1 | 2 | 3 | 4 |
| b. Your child is able to complete daily activities without losing their balance or stumbling (e.g. playing outside) | 1 | 2 | 3 | 4 |
| c. Your child is able to grip objects effectively when doing activities (e.g. grips pencil when doing homework, grips containers when opening them, grip knife when spreading bread) | 1 | 2 | 3 | 4 |
| d. Your child has adequate physical dexterity to complete activities (e.g. when tying shoelaces, fastening buttons/zips, physically moving their body to catch a ball) | 1 | 2 | 3 | 4 |
| e. Your child completes activities without physical fatigue (e.g. football, scooter/bike, swimming) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**ENVIRONMENT** – *help us understand how your child's **physical and social environment** supports him/her during the day*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your child is able to navigate their way around their physical environment when there is plenty of space (e.g. not bumping into things, spilling, or knocking things over) | 1 | 2 | 3 | 4 |
| b. Your community environment has opportunities to support your child to do activities (e.g. playground, swimming pool, bike trails, youth clubs, child's friends are close by) | 1 | 2 | 3 | 4 |
| c. At home, your child has access to the things to help them take part in activities (e.g. scooter/bike) | 1 | 2 | 3 | 4 |
| d. Family members are available to support your child to take part in activities (e.g. after school clubs) | 1 | 2 | 3 | 4 |
| e. The nursery/school environment supports your child to take part in nursery/school activities | 1 | 2 | 3 | 4 |
| f. Your child is able to complete activities in the usual/accepted way (e.g. can do shoelaces instead of using Velcro, team sports without changing rules) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**DEVELOPMENTAL HISTORY**

When was your child born? (circle) Full term (38-40 weeks) Premature Late

Were there any complications? YES/NO

If yes, please give details .....

Do you have any concerns about your child's development? YES/NO

If yes, please give details.....

.....

**DEVELOPMENTAL MILESTONES**

| | Age (months) | Comments |
|---|---|---|
| Smiling | | |
| Rolling Over | | |
| Sitting | | |
| Crawling | | |
| Bottom Shuffling | | |
| Standing | | |
| Walking | | |
| First Words | | |
| Toilet Trained | | |
| Hand Dominance | | |

**MEDICAL HISTORY**

Does your child have any other medical problems / take medication (e.g. asthma, allergies, etc.)?

If yes, please give details .....

Have you any concerns about your child's health (e.g. headaches, unsteady on feet etc)?

If yes, please give details .....

Has your child appeared to have lost any of the skills they had previously developed? YES/NO

If yes, please give details .....

Does your child complain of sore joints e.g. ankles, hips, wrists? YES/NO

If yes, please give details .....

Has your child had their eyes tested? YES/NO

If yes, by whom? .....

What was the outcome? .....

Have you any concerns about your child's eyesight? YES/NO

If yes, please give details .....

Has your child had their hearing tested? YES/NO

If yes, by whom? .....

What was the outcome? .....

Have you any concerns about your child's hearing? YES/NO

If yes, please give details .....

Is there anything else you feel we should know about your child's health/development (e.g. diagnosis of dyslexia etc)?

.....

.....

***Thank you for your help.***

**ACHIEVE Assessment – Education Questionnaire**
**Version 1.3(S) – 2014**

Queen Margaret University
EDINBURGH

An assessment has been requested for your pupil. To gain a complete picture of their abilities and difficulties we would like you to fill in a questionnaire.

Your pupil's therapist uses this form to collect information to complete an assessment of your pupil's strengths and challenges. Your input is an important part of completing this assessment, and helps develop a good picture of your pupil's abilities and needs. Your responses will also help identify what areas are most important to work on first in therapy.

Your pupil's therapist will find it very useful to read this information before they see your pupil.

**Education Questionnaire:**

- This questionnaire is designed for children from nursery to secondary school; please answer as many questions as you can so we have a full understanding of your pupil.

**Parent Questionnaire:**

- We have also asked your pupil's parent to complete a questionnaire to help us to develop a complete picture of their abilities and needs.

Your pupil is likely to have a mixture of ratings. Most young people will have some areas of strength, some areas that are adequate, some areas of minor difficulty, and some areas of strong concern. Completing this assessment as fully as you can gives the therapist a better understanding of your pupil and areas to be addressed during therapy.

The information in this questionnaire will be treated in the strictest confidence and will only be used to help us put together an accurate profile of your pupil's abilities.

**GOALS** – identifying this **pupil's goals** will help us understand how you hope they will become **successful learners, confident individuals, responsible citizens and effective contributors**

What are YOUR educational goals for this pupil? (e.g. curricular, organisational or other).....

.....

What do you think THIS PUPIL would like to get better at?.....

.....

Can you think why reaching these goals might be difficult for this pupil? .....

.....

**Please circle <u>only one</u> of the four choices, answer each question as fully as possible and select a response for <u>each question</u>**

**DOING ACTIVITIES** - *help us understand **how often** your pupil gets involved in the activities listed below:*

**LIFE SKILLS THAT RELATE TO NURSERY/SCHOOL**

| | <u>None of</u> the time | <u>Some of</u> the time | <u>Most of</u> the time | <u>All of</u> the time |
|---|---|---|---|---|
| g. Your pupil is able to clean him/herself after they've been to the toilet or manage their own personal hygiene (e.g. washing hands)..... | 1 | 2 | 3 | 4 |
| h. Your pupil is able to manage their clothing (e.g. managing their outdoor clothing when going to the playground, taking off a cardigan when they feel warm, managing their shoelaces) ..... | 1 | 2 | 3 | 4 |
| i. Your pupil is able to manage their own snacks/lunch in school (e.g. use a fork and or knife, open snack/drink containers) ..... | 1 | 2 | 3 | 4 |
| j. Your pupil is able to clean up effectively after an activity (e.g. wash paint brushes, tidy away an art activity, wash down table) ..... | 1 | 2 | 3 | 4 |
| k. Your pupil is able to get prepared for nursery/school in the morning (e.g. when they arrive at nursery/school their bag is organised, remembered P.E. kit, completed homework) ..... | 1 | 2 | 3 | 4 |
| l. Your pupil is able to move from one activity to another effectively (e.g. settle after play time, moving from play/P.E. to an activity that requires quiet listening and attention). ..... | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**NURSERY/SCHOOL ACTIVITIES**

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your pupil is able to use learning materials effectively (e.g. pens, pencils, crayons, rulers, glue sticks, scissors, computers) | 1 | 2 | 3 | 4 |
| b. Your pupil's shapes/letter formation/handwriting is effective, enabling them to complete drawing/art, maths, story writing/homework | 1 | 2 | 3 | 4 |
| c. Your pupil is able to successfully engage in P.E./gym sessions | 1 | 2 | 3 | 4 |
| d. Your pupil is able to successfully engage in curriculum activities (e.g. completing homework tasks) | 1 | 2 | 3 | 4 |
| e. Your pupil is able to organise themselves to manage nursery/classroom routines | 1 | 2 | 3 | 4 |
| f. Your pupil is able to get dressed after P.E./gym | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**COMMUNITY ACTIVITIES**

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your pupil is able to engage in activities that enable them to participate with their peers after nursery/school (e.g. climbing frames, scooters, bikes) | 1 | 2 | 3 | 4 |
| b. Your pupil is able to play with classmates/peers in an organised activity (e.g. tag, football, computer games) | 1 | 2 | 3 | 4 |
| c. Your pupil is able to participate in after nursery/school activities (e.g. music group, football, drama, swimming lesson/club) | 1 | 2 | 3 | 4 |
| d. Your pupil is able to participate in organised social events (e.g. nursery/school parties, events for parents) | 1 | 2 | 3 | 4 |
| e. Your pupil is able to participate with classmates/peers in leisure activities (e.g. swimming, bike riding, playing football together) | 1 | 2 | 3 | 4 |
| f. Your pupil is able to manage his/her clothes before and after an activity (e.g. swimming lesson/after school club) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**ROUTINE & ROLE** – *help us understand how your pupil **manages his/her routine and responsibilities***

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| d. Your pupil organises routines (e.g. organising belongings, organising homework) | 1 | 2 | 3 | 4 |
| e. Your pupil copes with changes in his/her routine | 1 | 2 | 3 | 4 |
| f. Your pupil copes with a variety of activities within their daily routine (e.g. nursery/classroom activities, P.E., after school clubs) | 1 | 2 | 3 | 4 |
| d. Your pupil understands their responsibilities (e.g. running errands, responsibility for tidying/managing nursery/classroom resources, completing homework) | 1 | 2 | 3 | 4 |
| e. Your pupil manages multiple responsibilities within a day (e.g. running errands, responsibility for tidying/managing nursery/classroom resources, completing tasks and homework) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**CONFIDENCE** – *help us understand how **confident** your pupil is*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| c. Your pupil is confident in their abilities | 1 | 2 | 3 | 4 |
| d. Your pupil enjoys nursery/school activities (e.g. drawing or handwriting nursery/school work, outdoor play or P.E.) | 1 | 2 | 3 | 4 |
| c. Your pupil seems satisfied with his/her performance in activities (e.g. drawing or handwriting nursery/school work, outdoor play or P.E.) | 1 | 2 | 3 | 4 |
| d. Your pupil can tell you what he/she wants to get better at (e.g. drawing or handwriting nursery/school work, outdoor play or P.E.) | 1 | 2 | 3 | 4 |
| e. Your pupil keeps trying despite challenges doing activities (e.g. drawing or handwriting nursery/school work, outdoor play or P.E.) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**SOCIAL SKILLS** – *help us understand how your pupil interacts **socially** with friends, and other adults*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| e. Your pupil plays/interacts well with others | 1 | 2 | 3 | 4 |
| f. Your pupil is chatty/sociable and talks with their friends | 1 | 2 | 3 | 4 |
| g. Your pupil speaks clearly when with others (e.g. with adults or when playing/working with classmates/friends) | 1 | 2 | 3 | 4 |
| h. Your pupil demonstrates an understanding of others' feelings (e.g. with adults/classmates or friends) | 1 | 2 | 3 | 4 |
| e. Your pupil can ask for the support he/she needs | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**ORGANISATIONAL SKILLS** – *help us understand how your pupil **organises him/herself** when playing and carrying out activities*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| f. Your pupil organises and uses objects to complete activities (e.g. nursery or classroom activities/homework) | 1 | 2 | 3 | 4 |
| g. Your pupil maintains concentration throughout activities | 1 | 2 | 3 | 4 |
| h. Your pupil works out problems if he/she gets stuck on a task | 1 | 2 | 3 | 4 |
| i. Your pupil follows through instructions to complete activities | 1 | 2 | 3 | 4 |
| j. Your pupil completes the steps of an activity in the right order | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**PHYSICAL SKILLS** – *help us understand how your pupil **physically moves his/her body** when playing and carrying out activities*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| a. Your pupil completes activities without being clumsy (e.g. avoids spilling fluids or banging/breaking objects during activities) | 1 | 2 | 3 | 4 |
| b. Your pupil is able to complete daily activities without losing their balance or stumbling (e.g. playing outside) | 1 | 2 | 3 | 4 |
| c. Your pupil is able to grip objects effectively when doing activities (e.g. grips pencil when doing drawing/writing, grips containers when opening them) | 1 | 2 | 3 | 4 |
| d. Your pupil has adequate physical dexterity to complete activities (e.g. when tying shoelaces, fastening buttons/zips, physically moving their body to catch a ball) | 1 | 2 | 3 | 4 |
| e. Your pupil completes activities without physical fatigue (e.g. football, scooter/bike, swimming) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

**ENVIRONMENT** – *help us understand how your pupil's **physical and social environment** supports him/her during the day*

| | None of the time | Some of the time | Most of the time | All of the time |
|---|---|---|---|---|
| g. Your pupil is able to navigate their way around their physical environment when there is plenty of space (e.g. not bumping into things, spilling, or knocking things over) | 1 | 2 | 3 | 4 |
| h. Your nursery/school environment has opportunities to support your pupil to do activities (e.g. playground activities, clubs, after school activities) | 1 | 2 | 3 | 4 |
| i. At nursery/school, your pupil has access to the things to help them take part in activities (e.g. looped scissors, chunky pencils, ICT) | 1 | 2 | 3 | 4 |
| j. Nursery/school staff are available to support your pupil to take part in activities (e.g. playground/classroom activities, after school clubs) | 1 | 2 | 3 | 4 |
| k. The nursery/school environment supports your pupil to take part in classroom activities (e.g. quiet spaces, small/large group work, individual working space) | 1 | 2 | 3 | 4 |
| l. Your pupil is able to complete activities in the usual/accepted way (e.g. can do shoelaces instead of using Velcro, team sports without changing rules) | 1 | 2 | 3 | 4 |

Additional comments: .....
.....
.....

***Thank you for your help.***

| Section | | Parent Wording | Education Wording |
|---|---|---|---|
| Home activities or Life skills relating to school | 1 | a. Your child is able to clean him/herself after they've been to the toilet or manage their own personal hygiene (e.g. washing hands) | a. Your pupil is able to clean him/herself after they've been to the toilet or manage their own personal hygiene (e.g. washing hands) |
| | | LA1 – Cleans self after toilet | |
| | 2 | b. Your child is able to manage their clothing (e.g. managing their outdoor clothing when going out , taking off a cardigan when they feel warm, manage their shoelaces) | b. Your pupil is able to manage their clothing (e.g. managing their outdoor clothing when going out, taking off a cardigan when they feel warm, manage their shoelaces) |
| | | LA2 – Manages clothing | |
| | 3 | c. Your child is able to help with making/manage their own snacks (e.g. use a fork and/or knife, open snack/drink containers) | c. Your pupil is able to manage their own snacks/lunch in school (e.g. use a fork and/or knife, open snack/drink containers) |
| | | LA3 – Manages snacks/lunch | |
| | 4 | d. Your child is able to help with or clean up effectively after an activity (e.g. tidy away an activity, tidy their room) | d. Your pupil is able to help with or clean up effectively after an activity (e.g. wash paint brushes, tidy away an art activity, wash down table) |
| | | LA4 – Cleans up after activity | |
| | 5 | e. Your child is able to get prepared for nursery/school in the morning (e.g. nursery/school bag organised, put on outdoor clothes/shoes) | e. Your pupil is able to get prepared for nursery/school in the morning (e.g. when they arrive at nursery/school their bag is organised, remembered P.E. kit etc.) |
| | | LA5 – Prepares self for school | |
| | 6 | f. Your child is able to move from one activity to another effectively (e.g. settle for a task that requires quiet listening and attention after playing with friends) | f. Your pupil is able to move from one activity to another effectively (e.g. settle after play time, moving from play/P.E. to an activity that requires quiet listening) |
| | | LA6 – Effectively moves between activities | |

| Section | | Parent Wording | Education Wording |
|---|---|---|---|
| Nursery/ school activities | 7 | a. Your child is able to use learning materials effectively (e.g. pens, pencils, crayons, rulers, glue sticks, scissors, computers) | a. Your pupil is able to use learning materials effectively (e.g. pens, pencils, crayons, rulers, glue sticks, scissors, computers) |
| | | SA1 – Effectively uses learning materials | |
| | 8 | b. Your child's making shapes/letter forming/handwriting is effective to complete art, maths, story writing (e.g. homework) | b. Your pupil's shapes/letter formation/handwriting is effective, enabling them to complete art, maths, story writing/homework |
| | | SA2 – Handwriting and shape making | |
| | 9 | c. Your child is able to successfully engage in sports days or other leisure activities in nursery/school | c. Your pupil is able to successfully engage in P.E./gym sessions |
| | | SA3 – Engages in sport activities | |
| | 10 | d. Your child is able to successfully engage in curriculum activities (e.g. completing homework tasks) | d. Your pupil is able to successfully engage in curriculum activities (e.g. completing homework tasks) |
| | | SA4 – Engages in sport activities | |
| | 11 | e. Your child is able to clean him/herself after they've been to the toilet at nursery/school | e. Your pupil is able to organise themselves to manage nursery/classroom routines |
| | | SA5P – Cleans self after toilet | SA5P – organises self |
| | 12 | f. Your child is able to get dressed after P.E./gym (e.g. change clothes for outdoor play, coat on/off) | f. Your pupil is able to get dressed after P.E./gym |
| | | SA6 – Dresses self after P.E. | |
| Community activities | 13 | a. Your child is able to ride a scooter/bike, rollerblade, skateboard, scooter etc. | a. Your pupil is able to engage in activities that enable them to participate with their peers after nursery/school (e.g. climbing frames, scooters, bikes) |
| | | CA1P – Ride bike/scooter, etc., | |
| | 14 | b. Your child is able to play with friends in an organised activity (e.g. tag, football, computer games) | b. Your pupil is able to play with classmates/peers in an organised activity (e.g. tag, football, computer games) |
| | | CA2 – Plays in organised group activities | |
| | 15 | c. Your child is able to participate in organised out of nursery/school clubs (e.g. scouts, martial arts, swimming lessons/club) | c. Your pupil is able to participate in organised out of nursery/school clubs (e.g. music group, football, drama, swimming lesson/club) |
| | | CA3 – Participates in out of school clubs | |

| Section | | Parent Wording | Education Wording |
|---|---|---|---|
| | 16 | d. Your child is able to participate in organised social events (e.g. birthday parties, family events) | d. Your pupil is able to participate in organised social events (e.g. nursery/school parties, events for parents) |
| | | CA4 – Participates in social events | |
| | 17 | e. Your child is able to participate with family in leisure activities (e.g. swimming, scooter/bike riding, playing football together) | e. Your pupil is able to participate with classmates/peers in leisure activities (e.g. swimming, bike riding, playing football together) |
| | | CA5 – Participates in leisure activities | |
| | 18 | f. Your child is able to manage his/her clothes before and after an activity (e.g. swimming lesson/after school club) | f. Your pupil is able to manage his/her clothes before and after an activity (e.g. swimming lesson/after school club) |
| | | CA6 – Manage clothes after leisure activity | |
| Routine & Role (Habituation) | 19 | a. Your child organises routines (e.g. morning routine, getting dressed, brushing teeth, breakfast) | a. Your pupil organises routines (e.g. organising belongings, organising homework) |
| | | RO1 – Organises routines | |
| | 20 | b. Your child copes with changes in his/her routine | b. Your pupil copes with changes in his/her routine |
| | | RO2 – Copes with changed routines | |
| | 21 | c. Your child copes with a variety of activities within their daily routine (e.g. after school club, swimming lessons) | c. Your pupil copes with a variety of activities within their daily routine (e.g. nursery/classroom activities, P.E., after school clubs) |
| | | RO3 – Copes with variety of activities | |
| | 22 | d. Your child understands their responsibilities (e.g. tidying away an activity, laying the table, walking the dog, making bed, completing homework) | d. Your pupil understands their responsibilities (e.g. running errands, responsibility for tidying/managing nursery/classroom resources, completing homework) |
| | | RO4 – Understands responsibilities | |
| | 23 | e. Your child manages multiple responsibilities within a day (e.g. at home, nursery/school and in the community) | e. Your pupil manages multiple responsibilities within a day (e.g. running errands, responsibility for tidying/managing nursery/classroom resources, completing tasks) |
| | | RO5 – Manages multiple responsibilities | |
| Confidence (Volition) | 24 | a. Your child is confident in their abilities | a. Your pupil is confident in their abilities |
| | | CO1 – Confident in abilities | |

| Section | | Parent Wording | Education Wording |
|---|---|---|---|
| | 25 | b. Your child enjoys daily activities (e.g. scooter/bike riding, swimming, homework, school work) | b. Your pupil enjoys nursery/school activities (e.g. drawing or handwriting nursery/school work, outdoor play or P.E.) |
| | | CO2 – Enjoys daily activities | |
| | 26 | c. Your child seems satisfied with his/her performance in activities (e.g. during play or activities in nursery/school) | c. Your pupil seems satisfied with his/her performance in activities (e.g. drawing or handwriting nursery/school work, outdoor play or P.E.) |
| | | CO3 – Satisfied with activity performance | |
| | 27 | d. Your child can tell you what he/she wants to get better at (e.g. riding a scooter/bike, nursery/school activity) | d. Your pupil can tell you what he/she wants to get better at (e.g. drawing or handwriting nursery/school work, outdoor play or P.E.) |
| | | CO4 – Tells what wants to get better at | |
| | 28 | e. Your child keeps trying despite challenges doing activities (e.g. playing football, doing homework) | e. Your pupil keeps trying despite challenges doing activities (e.g. drawing or handwriting, nursery/school work, outdoor play or P.E.) |
| | | CO5 – Keeps trying despite challenges | |
| Social skills (Social interaction skills) | 29 | a. Your child plays well with others | a. Your pupil plays/interacts well with others |
| | | SS1 – Plays/interacts well with others | |
| | 30 | b. Your child is chatty/sociable and talks with their friends | b. Your pupil is chatty/sociable and talks with their friends |
| | | SS2 – Chatty/sociable and talks with friends | |
| | 31 | c. Your child speaks clearly when with others (e.g. with family members or with friends) | c. Your pupil speaks clearly when with others (e.g. with adults or when playing/working with classmates/friends) |
| | | SS3 – Speaks clearly with others | |
| | 32 | d. Your child demonstrates an understanding of others' feelings (e.g. with family members or with friends) | d. Your pupil demonstrates an understanding of others' feelings (e.g. with adults/classmates or friends) |
| | | SS4 – Understands others' feelings | |
| | 33 | e. Your child can ask for the support he/she needs | e. Your pupil can ask for the support he/she needs |
| | | SS5 – Asks for support needed | |
| Organisation (Process skills) | 34 | a. Your child organises and uses objects to complete activities (e.g. homework, or household chores) | a. Your pupil organises and uses objects to complete activities (e.g. nursery or classroom |

| Section | | Parent Wording | Education Wording |
|---|---|---|---|
| | | | activities/homework) |
| | | OR1 – Organises and uses objects | |
| | 35 | b. Your child maintains concentration throughout activities | b. Your pupil maintains concentration throughout activities |
| | | OR2 – Maintains concentration | |
| | 36 | c. Your child works out problems if he/she gets stuck on a task | c. Your pupil works out problems if he/she gets stuck on a task |
| | | OR3 – Works out problems if stuck | |
| | 37 | d. Your child follows through instructions to complete activities | d. Your pupil follows through instructions to complete activities |
| | | OR4 – Follows through instructions | |
| | 38 | e. Your child completes the steps of an activity in the right order | e. Your pupil completes the steps of an activity in the right order |
| | | OR5 - Completes activity steps in right order | |
| Physical skills (Motor skills) | 39 | a. Your child completes activities without being clumsy (e.g. avoids spilling fluids or banging/breaking objects during household chores) | a. Your pupil completes activities without being clumsy (e.g. avoids spilling fluids or banging/breaking objects during activities) |
| | | PS1 – Is not clumsy during activities | |
| | 40 | b. Your child is able to complete daily activities without losing their balance or stumbling (e.g. playing outside) | b. Your pupil is able to complete daily activities without losing their balance or stumbling (e.g. playing outside) |
| | | PS2 – Does not lose balance during activities | |
| | 41 | c. Your child is able to grip objects effectively when doing activities (e.g. grips pencil when doing homework, grips containers when opening them) | c. Your pupil is able to grip objects effectively when doing activities (e.g. grips pencil when doing drawing/writing, grips containers when opening them) |
| | | PS3 – Grips objects effectively during activities | |
| | 42 | d. Your child has adequate physical dexterity to complete activities (e.g. when tying shoelaces, fastening buttons/zips, physically moving their body to catch a ball) | d. Your pupil has adequate physical dexterity to complete activities (e.g. when tying shoelaces, fastening buttons/zips, physically moving their body to catch a ball) |
| | | PS4 – Has adequate physical dexterity | |
| | 43 | e. Your child completes activities without physical fatigue (e.g. football, scooter/bike, swimming) | e. Your pupil completes activities without physical fatigue (e.g. football, scooter/bike, swimming) |
| | | PS5 – Does not fatigue during activities | |

| Section | | Parent Wording | Education Wording |
|---|---|---|---|
| Environment | 44 | a. Your child is able to navigate their way around their physical environment when there is plenty of space (e.g. not bumping into things, spilling or knocking things over) | a. Your pupil is able to navigate their way around their physical environment when there is plenty of space (e.g. not bumping into things, spilling or knocking things over) |
| | | EN1 – Navigating physical environment | |
| | 45 | b. Your community environment has opportunities to support your child to do activities (e.g. playground, swimming pool, bike trails, youth clubs, friends nearby) | b. Your nursery/school environment has opportunities to support your pupil to do activities (e.g. playground activities, clubs, after school activities) |
| | | EN2 – Opportunities in community/school environment for leisure | |
| | 46 | c. At home, your child has access to things to help them take part in activities (e.g. scooter/bike) | c. At nursery/school, your child has access to things to help them take part in activities (e.g. looped scissors, chunky pencils, ICT) |
| | | EN3 – Access to things to participate in activities | |
| | 47 | d. Family members are available to support your child to take part in activities (e.g. after school clubs) | d. Nursery/school staff are available to support your pupil to take part in activities (e.g. playground/classroom activities, after school clubs) |
| | | EN4 – Family/school staff available for support | |
| | 48 | e. The nursery/school environment supports your child to take part in nursery/school activities) | e. The nursery/school environment supports your child to take part in classroom activities (e.g. quiet spaces, small/large group work, individual working space) |
| | | EN5 - Nursery/school environment supports participation | |
| | 49 | f. Your child is able to complete activities in the usual/accepted way (e.g. can do shoelaces instead of using Velcro, team sports without changing the rules) | f. Your pupil is able to complete activities in the usual/accepted way (e.g. can do shoelaces instead of using Velcro, team sports without changing the rules) |
| | | EN6 – Completes activities without adaptations | |
| Emotions and sensations | 50 | a. Your pupil is calm and happy to be separated from parents/carers for short periods of time | a. Your pupil is calm and happy to be separated from parents/carers for short periods of time |
| | | EM1 – Calm and happy to be separated | |
| | 51 | b. Your child seems confident and self-assured | b. Your pupil seems confident and self-assured |
| | | EM2 – Confident and self-assured | |

| Section | | Parent Wording | Education Wording |
|---|---|---|---|
| | 52 | c. Your child is undaunted by, and willing to tackle, new experiences | c. Your pupil is undaunted by, and willing to tackle, new experiences |
| | | EM3 – Undaunted by new experiences | |
| | 53 | d. Your child is appropriately sensitive to things in their environment (e.g. can tolerate extremes of temperature, can block out noise, unfussy diet, likes most tastes or textures) | d. Your pupil is appropriately sensitive to things in their environment (e.g. can tolerate extremes of temperature, can block out noise, unfussy diet, likes most tastes or textures) |
| | | EM4 – Appropriately sensitive to environmental stimuli | |
| | 54 | e. Your child's level of alertness is about right (e.g. interested in activities, can get going and is motivated, energetic and does not complain of being 'overly tired') | e. Your pupil's level of alertness is about right (e.g. interested in activities, can get going and is motivated, energetic and does not complain of being 'overly tired') |
| | | EM5 – Level of alertness is about right | |

Definition of key terms

**Assessment**

Process followed, or resource used, to gather information about a child for the purposes of clinical practice or research.

**Classical test theory**

Approach to analysing assessment measurement qualities based on the assumption that an observed score on an assessment consists of the true score and measurement error score

**Environment**

Physical and social features of the external contexts in which children live and participate

**Item response theory**

Overarching approach to analysing the measurement qualities of assessment that is based on the assumption that the probability of a score on an item encompasses the individual's ability and item's difficulty

**Motor skills**

Actions that a child performs to interact with objects and move themselves around the environment

**Participation**

Children's involvement in life situations as relevant and meaningful to their own context

**Performance skills**

Observable, goal-directed actions that children perform to complete tasks and actions during the course of everyday life

**Process skills**

Children's ability to appropriately sequence steps of an activity, select objects appropriate to an activity and demonstrate adaptability to changing situations when problems occur

**Rasch analysis**

One approach to applying item response theory that uses an equation to calculate the probability of a respondent of ability *Bn* endorsing an item of difficulty *Di*

**Social interaction skills**

Observable skills that children use during social exchanges, including using socially appropriate gestures, making eye contact and making relevant responses

Abbreviations

*Assessment abbreviations are included in table 4-1 on page 73*

| | |
|---|---|
| **A DIF** | Age-related differential item function |
| **ADHD** | Attention deficit hyperactivity disorder |
| **CP** | Cerebral palsy |
| **CTT** | Classical Test Theory |
| **DCD** | Developmental Coordination Disorder |
| **DIF** | Differential Item Function |
| **G DIF** | Gender-related differential item function |
| **IRT** | Item Response Theory |
| **MnSq** | Mean square |
| **MOHO** | Model of Human Occupation |
| **N** | Number count |
| **P** | Probability |
| **R DIF** | Reasons for referral-related differential item function |
| **S.E** | Standard error |
| **ZSTD** | Standardised Z score |

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